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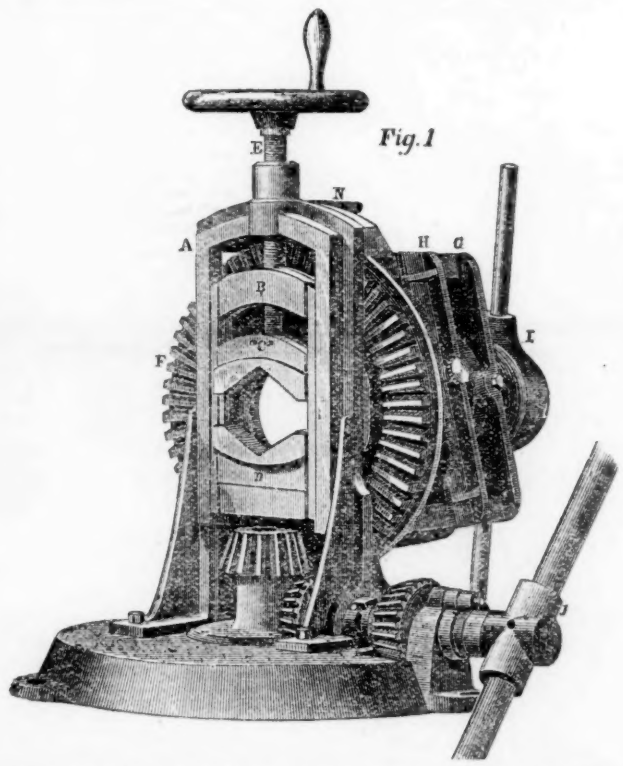

Fig. 1

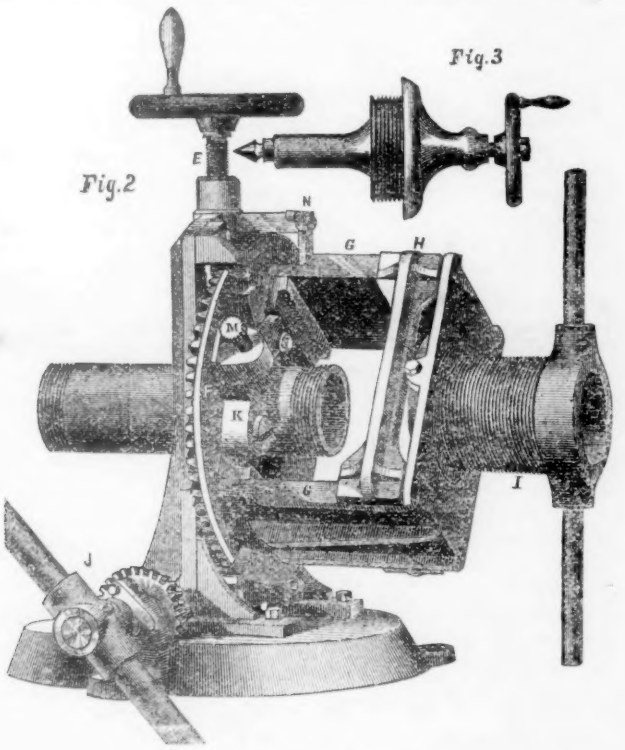

Fig. 2

Fig. 3

Improved Pipe and Bolt Threader, Cutter, and Nut Tapping Machine.

The accompanying engravings illustrate an improved machine, intended to perform the work enumerated in the title of this article, the nature and advantages of which are specified in the following description:

A is the frame which supports the entire machine. In this frame slides a vise holder, B. The shape of the vise holder is a parallelogram, except at the top, which is slightly arched. It slides in ways formed on the inside of the vertical part of the frame. On the inside of the vertical part of the vise holder, B, are formed ways which guide the movement of the upper half of the vise, C. The lower half of the vise, D, is fastened in the lower part of the vise holder, B. In the arched top of the vise holder is formed a threaded hole for the upper part of the differential screw, E. A thread is also formed in the upper part of the frame, A. The end of the differential screw plays freely in a step socket in the upper part of the vise, C. The pitch of the screw in the upper part of the frame is twelve to the inch, and in the upper part of the vise holder, B, it has a double thread, six to the inch. The turning of the screw, therefore, causes the lower part of the vise holder, B, to rise, while the upper part of the vise, C, descends, or *vice versa*. The purpose of this movement is not only to gripe the pipe or bar to be threaded or cut off with great firmness, but also to make the apparatus self-centering. To the front side of the wheel, F, is attached the casting, G, which forms ways upon which the die carriage, H, travels. By this means the dies are carried forward constantly parallel to themselves and the work, thus obviating friction from any deviation from the parallel motion, and preventing stripping of the thread—a difficulty heretofore encountered in many pipe cutting machines. The die carriage is forced forward at the commencement of the operation by means of the left hand lever screw, I, the purpose of which is to make the dies engage the work at the beginning. As soon as the thread is started, the carriage, H, traverses of itself, at a rate corresponding to the pitch of the screw cut, in the same way as a chaser follows the thread in cutting a screw in a hand lathe. The carriage, H, the casting, G, and the wheel, F, are all caused to rotate by means of bevel gearing actuated by means of the balanced lever handle, J, which is shown broken away in the engraving, to avoid unnecessary space. K, Fig. 2, represents the cutting device, by which pipes or bars are cut off. This consists of a pivoted tool holder, which is fed by the ratchet headed screw, M, which turns in the threaded hole formed in a lug.

Motion is imparted to the screw, M, by coming in contact with the pawl, N, at every revolution of the wheel, except when the pawl is turned up out of the way in cutting threads. In this way, an automatic intermittent feed is obtained, which is considered of great advantage, as, in machines with automatic continuous feed, the contact of the tool with a high spot in the iron often results in splitting the pipe, owing to the increasing depth of cut consequent upon the nature of the feed and upon the suddenly increased depth of the cut caused by the lump. The reason for this is that, with the continuous automatic feed, the tool is constantly entering deeper and deeper into the material, while with the intermittent automatic feed it can be so set as to cut only to such a depth as ensures safety to the tool and to the material itself, according to the nature of the work to be performed.

In the performance of most kinds of work, a deeper cut can be taken, and the cutting can be performed faster than with machines having automatic continuous feed. By sliding the handle, J, in or out, so that a pin on the shaft engages with the inner or outer pinion of machine, the speed of machine is increased or lessened as desired.

Fig. 2 represents the machine in the operation of cutting off a piece of pipe. The machine can also be used for tapping nuts, the tap being held in the vise and the nut in the carriage, H, or *vice versa*.

Fig. 3 shows a centering device, which is put in place of the screw, I, for centering bars after they have been cut off, and to prepare them for turning in the lathe. Either square or round iron may be thus cut off and centered, the screw, I, being removed, and the centering device in Fig. 3 being substituted.

It will be seen tnat the capacity of this machine is unusual. It cuts and threads pipes and bolts, taps nuts, and cuts off and centers bars to fit them for the lathe. It is extremely campact, weighing only 180 pounds, and can be run either by hand or power. One man can thread three-inch pipe with ease with the dies furnished with this machine. A power attachment is supplied with a backward and forward fast and slow motion, so that the machine can be driven by power by merely throwing the belt over the main shaft, without putting up a counter shaft. The machine is therefore portable, and its convenience is greatly enhanced. It can be used in any part of the shop where it is most convenient. All the parts are interchangeable, and may be replaced when damaged by any accident.

Patents for this machine have recently been obtained. Further particulars may be obtained by addressing Mr. C. T. Litchfield, General Manager of the Empire Manufacturing Company, 18 William street, New York city.

Draining Mines in England.

The *Iron Age* tells us of a new apparatus, of Messrs. Tangye Bros., of Soho.

It consists of a steam pump placed at the bottom of the pit, and often far away in the workings directly over the source of the water, which is by its operation forced up a pipe to the pit mouth, the height to which the water may be raised being limited only by the strength of the apparatus and the steam force supplied by the boiler. The construction of Messrs. Tangye's steam pump is simplicity itself. The steam cylinder is placed horizontally on a base plate in direct line with the pump, and the same piston rod goes into both steam and pumping cylinders; thus no fly-wheel, crank, or extraneous gear of any kind is required, and the only moving part which can be seen is the piston rod as it passes to and fro from one cylinder to the other. Each stroke of the pump has the effect at one end of sucking water into the apparatus, and at the other of forcing water, already drawn up, into the discharge pipe, an air vessel being conveniently situated so as to prevent concussion. The pair of pumps just completed, and which we had the pleasure of inspecting, are of larger than usual dimensions. The steam cylinders are of 32 inches diameter; the pumping cylinders of 7 inches in diameter, with a stroke of 6 feet, and the air vessel is 18 feet high, with an internal diameter of 24 inches. The pumps are brass lined, and have four separate valves, fitted with multiple valves, and the whole apparatus is mounted upon massive base plates. It is intended to place these pumps at the bottom of a pit 1,068 feet deep, and with 35 lbs. pressure of steam they will force to the surface 18,000 gallons of water per hour in one direct lift. The engines are so arranged that they can be both worked together if their full capacity is required, or if the supply of water is at any time less, either engine or pump can be easily shut off, and the other only need be worked. With regard to the supply of steam power, the boiler can, if space permit, be placed in the working close to the pumping apparatus; but, if this should be found inconvenient, steam can be conveyed by a pipe down from the boiler at the top.

Chemical Repertory.

No. 120.—October 2, 1874.

EDITOR—HENRY WURTZ.

CHEMICAL EXCERPTS.

1240. California Cores.—Another industry is being developed in California. The *Alta California* says that cork trees grow very rapidly among the foothills. At Auburn there are a number of trees three or four years old that have bark thick enough for an ordinary cork.

1241. Metamorphic Heat.—The *Scientific Press* tells us that on account of the extreme heat in the mines of the Comstock, the men are supplied with ice-water, the consumption of which is enormous, the Belcher mine using 6,500 pounds of ice daily, the Consolidated Virginia 7,000 and other mines in proportion.

1242. Deadly.—A recent patentee, who imitates "Russia Iron," and whose name is Stackhouse, claims "the use principally of *oxalic acid* thrown between the sheets of iron before their last pass through the rolls. It is said that the imitation is almost perfect."

Any chemist who has inhaled the deadly vapor of oxalic acid by accident, knows how it is likely to be with the poor operatives, when this lovely invention comes to be operated.

1243. English Dip Seal Patent.—R. M. Caffall, 75 Fleet Street, London, and A. Thomas, Alton, Hants. Improved means of and appliances for effecting the automatic sealing of hydraulic gas mains, and for removing the pressure of gas retorts at pleasure. —These consist mainly in an employment of a loose extension portion of pipe below that known as the dip pipe in the hydraulic main, which extension piece is capable of being raised and lowered from the outside, preferably by a rod connecting the extension piace with a lever.

1244. Gasophonic. — In relation to "Sounding Flames," an Edinburgh student writes: "In the practical class we produced sonorous flame vibrations in iron tubes three to four inches in diameter, and about two feet long, held over similar tubes covered with wire gauze. These instruments produced a noise like the roar of a lion."

1247. Another Gas-Well Locality.—A well has been sunk at Freeport, Pa., by Messrs. Rowand and Murphy, to the depth of 1200 feet. They have gas enough now to furnish steam for their planing mill, but will sink deeper, as they want enough to light up the town. They will not object to striking a vein of oil, but it is said they do not expect to be so fortunate. However, there is nothing like trying.—*National Oil Journal.*

1246. Imperial Gas Company of London.—Notwithstanding the increase which the company was authorised to make in the price of gas, the available balance is £26,583 short of the amount required for the usual half-yearly dividend at the rate of 10 per cent. per annum, and this deficiency has to be supplied from the reserve. The directors state that this result is due to the high price of the coal contract made last year having been still in force, and also to the low prices obtainable for coke, which were below the estimated rate.—*British Trade Journal.*

1247. The "Hartley Mineral."—We learn from an exchange that 500 tons of this mineral has been brought here. We quote further: "This peculiar variety of shale is very valuable as an enricher. It is used largely at Sydney, N. S. W., where it is said to yield 18,000 feet of 50 candle gas to the ton. Tests made at some of our New York works placed its value at about double that of best Cannelton Cannel, which sells here now at $12.50 per ton. The actual cost of the Australian shale put down here is said to be $35 to $36 gold. The importation must result in a considerable loss and will not be repeated. A large quantity of this shale is used in San Francisco; and is said to give great satisfaction."

1248. Marsh-Gas Under Pittsburgh.—Some fifteen years ago a well was bored at the south end of the Smithfield street bridge for salt, but when the depth of about 600 feet had been attained, gas rushed out in such a volume that the hole had to be stopped up and abandoned. The spot named is right in the midst of a number of the South Side mills. This is another favorable indication that our manufacturers can get gas if they will bore for it, and perhaps in sufficient quantity to enable them to dispense with coal altogether.—*Coal-Trade Journal.*

1249. Trade in Gas-Coals.—The *Engineering and Mining Journal* tells us that the gas companies find the hard times have greatly diminished the consumption of gas, and as the progress made in the manufacture of gas causes a greater yield than formerly from every ton of coal, the demand for gas coal is less than last year. The N w York companies are carrying very heavy stocks. The Manhattan, for example, has on hands 110,000 tons, and contracted for, in addition, 30,000 tons; a supply sufficient to last for more than a year, With the greatly increased facilities for obtaining gas coals, it is very doubtful if this policy of carrying enormous stocks be well advised.

1250. Wrought Iron and Gases.—Dr. A. P. S. Stuart stated that an unglazed wrought iron tube, when deprived of air and heated, allows hydrogen gas to pass through its pores, but when externally glazed and heated, such a tube becomes perfectly impervious to gases. Such a tube was therefore, for obvious reasons, well suited for making nitrogen determinations, and experiments, so far as they have been made, promise excellent results. During the experiments made by the writer on this subject, his attention was called to an inference of Prof. Graham on the origin of hydrogen in meteoric iron, and the suggestion was made that possibly such hydrogen did not come from the celestial spaces, but from water decomposed by the hot iron when it was buried in the earth.—*American Association at Dansville.*

1251. Petroleum Engine Patent.—J. Hock, 26 Ely Place, Holborn, London.—Improvements in motor engines worked by the introduction of petroleum or other liquid hydrocarbons.—A piston connected to a crank is moved over part of its stroke by the momentum of a fly-wheel, and draws into the cylinder a charge of air and liquid hydrocarbons broken into spray by the entering current of air. A crank, cam, or eccentric works a pump bellows or elastic ball, which sends air through volatile petroleum or other hydrocarbon. Part of the air thus charged with combustible matter supports a constant flame near the opening into the cylinder, another portion is at the proper time made to jet across this flame, and so carry a flame into the cylinder and ignite the charge therein. The pressure resulting from combustion closes the inlet valves and propels the piston. During the return stroke of the piston a slide or valve is opened for the escape of the products of combustion.

1252. New Stir Among the Producers.—About forty prominent oil operators convened at Petrolia, September 2nd, to discuss the present ruinous condition of the petroleum business, and adopt measures for remedying the same. A number of methods were proposed but nothing definite was decided upon. The plan however, most generally talked of was to make an effort at consolidating the producing interests, for mutual protection, by placing the management of the entire business in the hands of trustees. A committee was appointed to decide on some plan for action. —*Oilman's Journal.*

River-Water Pollution and Purification.

The *Moniteur Scientifique* gives an interesting *resume* of the investigation entered on by M. Gerardin, under the orders of the Minister of Public Instruction of France, in reference to river pollution, in terms analogous to those of the Rivers Pollution Commissioners of the United Kingdom. M. Gerardin, in the course of his investigations, examined the numerous watercourses embraced in the basin of the Croult, a river which falls into the Seine near St. Denis. The circumstances of the river are most favorable for the purposes of such an examination, considering that it includes causes of pollution from mineral, manufacturing, and other various sources of water impurity and corruption. The comparative examination of the various liquids proved that no criterion of really safe water for domestic use could be arrived at either in respect to color, smell, or taste, nor even by chemical analysis. Turbid water might not be dangerous while that perfectly clear and without smell might be so. A healthy water generally gave identical results on chemical analysis. In fact, there seems to be only one method of testing the salubrity of any water, and that is by observing its effects on living organisms. A water is healthy when animals and the higher class of vegetation can live in it; it is infected when it causes the death of all but infusorial animals and cryptogamous plants. The fact of finding fish in a river water is a guarantee of the goodness of its water.

When the water undergoes a change for the worse fish are seen to mount to the surface and choose places where purer water enters, and if they leave this they die. M. Gerardin cites several instances in which such phenomena were observed. He found, also, that aquatic plants were sensitive to the variation in the qualities of water; but that sensitiveness was unequal in its character. The most delicate test was that of cress (*cresson de fontaine*), whose presence showed that of excellent water. M. Gerardin cites instances in which such cress perished after a few hours, owing to the entrance into the stream of feculent matter. He describes various other water plants all more or less sensitive to the action of impure water. Among the most robust of such plants he instances the *Arundo phragmites*, which resists the action of the most impure water. Among animals the mollusc known as the *Physa bontinalis* only exists in very pure waters; the *Valcata piscinalis* in healthy water; others supported themselves in a medium quality; but no mollusc can live in absolutely impure water. Hence phanerogamous vegetables and molluscs indicate the different character of water in regard to purity; but infusoria, cryptogamic plants, and especially the algæ, afford also indication in the successive changes they undergo by impurification of the water. These inferior organisms survive after the disappearance of fish, molluscs, and green plants.

When the degeneration of the water is in progress, the river loses its limpidity, the water acquires an opaline appearance, and this color resists filtration. The surface is covered with froth, and the water deposits a black matter fœtid to the smell, and disengaging bubbles of gas. Sulphides soon appear, which are evident by their action on silver vessels in kitchens near the bank, turning such vessels black. The water is then not only offensive to the taste, but is really poisonous. M. Gerardin cites the instance of a child who, accidentally falling into the water of a river of this class, died of poisoning.

Chemical analysis employed in the examination of the Croult water and its affluents showed the presence of a notable quantity of organic matter, but the artesian wells of St. Denis showed similar results, although the water was less unhealthy. A microscopical examination of the mud covering the bed of the river showed M. Gerardin some very reliable results. When he commenced his observations in September, 1868, the sugar and other works were commencing full operations. The Croult became covered with white froth, while the mud was black, very light in density, about one metre thick, and covered with a thin white pellicle, which deposited itself on the surface of the stones, the water sluices, weirs, etc. A microscopic examination showed that the white dirt or matter consisted of the *Beggiatoa alba*, a species of shifting algæ.

These cryptogamia remained until the month of March, when the season of carrying on the works ceased. After this period black masses rose to the surface of the water, which showed the same kind of alga in a state of decomposition, and among them appeared another kind of alga, the *Oscillaria natans*. This remained until the annual cleansing of the Croult and Rouillon, which takes place in the second week of June. After this cleansing the water ran black for several days, it then became clear, and the river was purified. But when the works began again in the middle of August, all the previous signs of impurity became evident.

The impurity of the Molette resembled that of the Croult, but its impurities were of a more special kind, owing to various manufacturing waste being cast into it. It had the characteristic fungus known as rat's-tail. Its water, at first clear and limpid, was loaded with putrescible matter as it passed from the works on its banks. The infusoria present indicated pollution by animal matter, while the white algæ indicated that by vegetable matter. In a portion of the water which was less impure, there were green algæ present. During the war of 1870, the banks of the Ourcq Canal having been broken by the enemy, the water ran into the Croult. Eventually the rivers were restored to their previous condition, but it was found that the *Beggiatoa* and *Oscillaria natans* were replaced by *Zygnema*, *Spirogyra*, etc.

In the course of his investigations, M. Gerardin made a remarkable discovery. When a water retains a normal proportion of dissolved oxygen, the lives of fish and green plants are preserved, and so far it may be probably good. When the oxygen diminishes, those animals having the most active respiration first disappear, and subsequently those of lower respirative powers. This same cause influences the vitality of aquatic plants. A corrupted water is consequently one in which dissolved oxygen is absent; in notoriously bad water no dissolved oxygen is found. Consequently the sanitary condition of water employed for domestic purposes is intimately related to the presence or absence of dissolved oxygen, and the proportion of the presence of this gas in that form determines the hygienic state of the water.

The determination of such oxygen, by the methods hitherto adopted, has been both difficult and complicated, and inapplicable to liquids which so rapidly change their condition, even in closed vessels. It was necessary, therefore, to find a reagent which would allow of the instantaneous determination by means of a titrating liquid. For this purpose M. Gerardin employed hydrosulphite of soda. The amount of dissolved oxygen is determined by the discoloration through the titrating liquid added to the water, first colored lightly by aniline blue. M. Gerardin thus relies on three methods of determining the amount of impurity of water—viz:

1st. Observations on the higher class of living plants and animals therein.

2d. The microscopic examination of infusoria and algæ.

3d. The determination of the amount of dissolved oxygen present.

These various methods he has amply tested in the laboratory by direct experiments in water purposely rendered impure by sewage, etc., with the same results as those already described in reference to the Croult.

M. Gerardin therefore concludes that organic matters in a state of decomposition deprive the water of its dissolved oxygen, and consequently render it impossible that either plants or animals of superior organization could live therein. Such matters reduce the sulphates, transform them into sulphides, and are the cause of the evolution of sulphuretted hydrogen. If the refuse water of manufactories be exposed to putrid fermentation in suitable tanks, aerating them on a large surface, the water may subsequently be allowed to flow into a river. By agitating the water it is made more readily to absorb oxygen, and by such a plan the fishers of Les Vosges are enabled to transport living trout in vessels of water constantly kept in lively action.

To purify water sent from factories M. Gerardin recommends that they should be spread over a surface of land previously well-drained; but careful choice of the soil is requisite, as in a very sandy soil the liquid passes off without oxidation and injures adjacent vegetation, and poisons wells at some distance off. In his experiments he found that an argillaceous earth was most to be preferred, as shown by the results he obtained at Sonesse, where one of the manufactures had been the chief cause of the pollution of the Croult. At Bourget it was similarly attempted to purify the waste water of a factory; but this at first failed, from using too small a surface. On this being enlarged the result was successful. (In fact, the system M. Gerardin recommends is generally similar to that adopted in English irrigation sewage farms.)

In conclusion, M. Gerardin remarks that the causes of ill-health which result from the concentration of populations in towns and the multiplication of factories are more serious than generally is supposed; but on the other hand, it is possible to remedy such evils. Consequently nothing can excuse the supineness which leaves such dangers unabated; and it is the duty of the Legislature (in France) to avert the possible calamity of epidemics. The cost would be repaid a hundred fold in the consequent prosperity which would arise from the purification of the rivers, for human life would be lengthened, and a diminution of the average mortality be effected.

The Construction of Wells.

Pure water is one of the necessaries of civilized existence, and just in proportion to the increase of population and the advance of civilization, does it become difficult to obtain it. On country farms it is easy to find pure bubbling springs on any hillside, but in cities and villages the difficulty of keeping wells and springs free from contamination is very great. Recent investigations by M. Lefort prove that in order to keep wells from contamination, it does not suffice to place them at a distance of 100 metres (rather more than 100 yards), from burial grounds, battlefields, or cesspools. If, then, a distance of 100 metres is insufficient to prevent the infiltration of injurious matter into wells, what must we think of our city and village wells, which are frequently located within a dozen yards of barnyards and cesspools? Of course, the character of the soil has much to do with the purity of the well; but in many cases, much sickness would be avoided if all water used for domestic purposes were carefully filtered, or if cesspools were abolished, and resort had to the deodorizing agency of dry clay, as used in the earth-closet.

The fact that most wells, as at present constructed, are liable to be contaminated with sewage and the drainings from cesspools, which either flow in from the surface or reach the well by passing through veins, fissures, gravel-beds, or other porous layers at a lower level, has aroused a feeling in the popular mind which we hope will lead to such action, as will speedily remove this source of disease and death. Two courses are open to us. One is to abolish all cesspools, and adopt the more convenient as well as less offensive system, which depends upon the deodorization of fæcal matter, and its utilization as manure; the other consists in so constructing our wells that nothing can reach them except that which has been filtered through dense beds of soil. Merely passing through fissures in the soil will not answer; every particle of the water must come into contact with the soil, so as to be freed from all offensive matter. To secure this we must make sure that wherever our well passes through a porous stratum, the fluids which may, by any possibility, pass through that stratum, shall be prevented

from entering the well. The only effectual method of accomplishing this is either by puddling or the use of cement.

Almost all wells are stoned up with loose stones, laid dry, so that any liquid that reaches them has free access to the well. Even where the bore of the well posses through gravel-beds, it is not usual, at least in this country, to use any precautions looking to the prevention of this evil; and we have even seen a well sunk in a barnyard and stoned up with loose stones. The worst of it is that such impurities are not readily detected by the senses. Sewage water that has had the cruder portion of its impurities removed by imperfect filtration, is not only clear and sparkling, but peculiarly pleasant to the taste, from the gases and salts which it contains; but it is, nevertheless, the the source of some of our most fatal diseases. The only way to remove this poisonous quality, is to filter the water either through a thick and dense bed of soil, or a thick layer of charcoal; and as it very rarely happens that it is convenient to do this after the water has been drawn from the wells we ought to use every means to keep impure water out.—*Prof. Phin, in Technologist.*

First Use of Illuminating Gas in America

It is asserted that gas was first used for lighting buildings in Rhode Island. On the 13th of November, 1813, David Mellville, of Newport, and Winslow Lewis, of Boston, announced that they had become the proprietors of a patent issued by the President of the United States, of an improved gas lamp for lighting manufactories, mills, mines, theatres, etc., with hydrogen gas or inflammable air produced from pit coal. The proprietors asserted that the new light was safer, more agreeable, and less expensive than any other, and that there was no danger from sparks or the use of snuffers, as was the case in the use of oil-lamps and candles. Insurance rates would thus be lowered, and a great saving would be secured to the manufacturer who used the new gas light. Persons were referring to a building in Newport, R. I., in which the new system was in successful operation, and also the cotton manufactory belonging to Seth Bemis, at Watertown, Mass. They further stated that the patentee had just (November 13, 1813), placed the new system in the Wenscutt factory, one and a quarter miles from Mill Bridge, which mill was brilliantly illuminated every evening. Gentlemen interested in cotton mills were urged to visit these places, and inspect the new invention. The proprietors offered to furnish the necessary apparatus for any number of burners at ten days' notice.

The Arkwright mill, then principally owned by Mr. James De Wolf, was also lighted by gas under this patent. The works were erected under the superintendence of Mr. Melville. This, however, must have been subsequent to the Wenscutt works, since, had the works at Arkwright been in operation at the date of Mr. Mellville's advertisement, he would undoubtedly have referred to that mill instead of Mr. Bemis's at Watertown, and the building at Watertown, and the building at Newport; unless, indeed, the fatal accident which happened at Arkwright induced Mr. Mellville to suppress the fact. In this view we do not concur. The story of the accident, gathered entirely from recollection, seems to be as follows:

Mr. Abraham Churchill, employed in the capacity of watchman, saw what he thought to be a light moving about the mill, and went to the building adjoining, which contained the gasometer. Entering this building, he removed the candle from the lantern, and holding the flame to the mouth of a large stop-cock, turned on the gas. The flames were instantly drawn within the gasometer, which exploded, destroying the building and so injuring Mr. Churchill that he died the following morning. He was undoubtedly led to this act by seeing Mr. Mellville perform a similar experiment. Mr. Mellville had constructed a tube on the top of the gasometer, from which, on removing a plug, a jet of gas would escape. This jet he would light, thus throwing up a flame two or more feet high tothe delectation of the spectators. But Mr. Mellville was always careful to see sufficient pressure applied before ignition. This lack of pressure was probably fatal to Mr. Churchill.

Such are the facts so far as we can gather them. We have not discovered (although we have diligently searched) the date of Mr. Churchill's death, nor any reference to the accident in the public prints. The gasometer was never rebuilt at Arkwright, and we can readily conceive the effect of such an accident on the new enterprise. Reasoning from the facts, it seems to us unlikely that the first gas works in Rhode Island were erected at the Arkwright mill. In England gas was used in partially lighting a mill as early as 1798, and a mill at Bolton, England, was fully lighted in 1805. The London Gaslight Company soon followed in 1810. So that it is probable that Mr. Mellville's process came from England, and with the collapse at Arkwright went out in Rhode Island for many years. —*Iron Age.*

Inflammability of Mineral Oils.

In some experiments on the communication of fire to petroleum when in barrels or unconfined, it was found that crude petroleum when poured over a closed barrel containing other petroleum and set on fire, burned off too rapidly to communicate the heat to the oil in the barrel so as to ignite it. A layer of burning naphtha two centimetres in depth in the open air, was extinguished by throwing sand or earth upon it; but when the layer was four centimetres in depth, sand thrown on it to the depth of 7 or 8 centimetres did not suffice to extinguish it. To determine the rapidity of evaporation, 210 c. c. of different products were exposed in vessels which afforded an evaporating surface of 30 square centimetres, and left at the ordinary temperature to evaporate spontaneously for twenty-four hours. Taking the evaporation of refined petroleum as 0, the results were as follows:

Refined petroleum evaporation	0	volume.
Crude	2·57	"
Alcohol evaporation	5·14	"
Naphtha evaporation	12·14	"

Experiments in Pennsylvania, on the same subject, the experiment having been conducted at 16°, gave results as follows with refined petroleum of different kinds:

Boiling point below		100	loss 100	p. c.	
"	" from	100° to 120	"	44·5	"
"	" "	120 " 150	"	31·5	"
"	" "	150 " 200	"	8·5	"
"	" "	200 " 250	"	0·25	"
"	" "	250 " 350	"	0·00	"

Attempts to save vessels loaded with petroleum by scuttling, is mentioned as being dangerous to neighboring shipping, on account of the low specific gravity of the petroleum, and ineffectual as regards the vessel on fire itself for the same reason. Metallic receptacles for retaining and shipping petroleum are not to be recommended.—M. Barrett.—*Annales du Genie Civil.*

Why Solid Iron Floats in Molten Iron.—Two explanations, says Dr. Van der Weyde, are given of the floating of solid iron in melted iron. The first is, that the iron expands in solidifying, as water does, and that therefore solid iron when heated is specifically lighter than liquid iron, and floats upon it as ice floats upon water. This supposition, however, is incorrect, inasmuch as it is based upon an erroneous assumption. Iron does not expand in solidifying; a fact of which any one may convince himself by brief observation in a foundry. The fact is just the reverse; the metal shrinking during solidification, after having been cast in a mould. By casting, for instance, a long piece in a vertical mould, the solidified piece will not fill the mould to the top, as did the liquid iron. The explanation given by Dr. Van der Weyde himself is, that the iron is surrounded by a film of air adhering to it, which repels the melted iron and prevents perfect contact; on which account the solid piece displaces more liquid metal than its own weight amounts to, and consequently it floats.

Corrosion of Tin and Tin-Lined Water-Pipes.

From an advance sheet of the *Boston Journal of Chemistry*

We have been much interested in reading the article of Prof. S. P. Sharples in the July issue of the Journal (See *Chemical News*), and are moved thereby to give briefly some of the results of our own practical experience, extending over more than twenty-five years, regarding the action of water on lead and tin pipes.

We have during this time put into and taken out from wells, springs, and aqueducts thousands of feet of tin and tin-lined pipes, and in no instance within our recollection, where we have seen the interior surface of any of those pipes after a year's use, have we failed to discover more or less corrosion.

Spring and well water seem to act upon the tin quicker than pond or river water.

Hundreds of feet of block-tin pipe which we have put into wells we have been called upon to replace with new after ten or twelve years' use, the old pipes being so corroded as to be useless. Portions of some of them we have found to be so completely oxidised as to crumble at the touch, while other portions of the same pipe would be comparatively smooth and free from any corrosion.

Called upon a few days since to make some repairs upon an ordinary house-pump, we had occasion, in taking it down, to cut off the pipe leading to the well, and an examination of this showed it to be tin-lined lead pipe considerably corroded, the tin being completely eaten through, in many places of the size of small shot. Pursuing the investigations still further, we found a short piece of lead pipe (unlined), connected between the tin-lined pipe and the pump, which was perfectly smooth and free from the action of water. The solder joining the two, a mixture of probably nearly equal parts of lead and tin, was also bright and smooth.

The facts ascertained upon inquiry were these:

Twelve years ago the pump was put in with lead pipe leading to well, and after a lapse of eight years the lead pipe was replaced by the tin-lined, with the exception of the short piece before mentioned, which for some reason was left untouched. Here, then, we have tin and lead under precisely the same conditions of exposure, the former practically useless after four years' use, while the latter was absolutely perfect and uninjured after twelve years' contact with water.

This case, as regards the durability of the lead, we should call exceptional, as most pipes of that metal, exposed to the same test, would show the action of the water in ten or twelve years.

We never had any reason for supposing that the tin furnished by any manufacturer was anything but commercially pure tin, but it is well known among plumbers that occasionally a pig of tin is found, which will not make good plumbers' solder by reason of the natural impurities contained in it; and our theory of the matter is, that it is these natural impurities existing in both lead and tin pipes which are corroded away by the water from the purer surrounding portions. In no other way can we account for the smooth and sound appearance often found in the same pipe in close proximity to badly corroded portions.

A. M. KNIGHT & SON,

SPRINGFIELD, July, 1874. [*Chemical News.*

On the Utilization of Ammoniacal Liquor in Small Gas Works.

Since the value of sulphate of ammonia has been recognized for agricultural purposes, all gas-works of a certain extent have erected plant for the production of this salt, and in such cases a profit has been obtained to the extent of above 1·5 francs (say 1½d.) per ton of coal when the works were of large size. But small gas works have not yet participated in such advantages, their extent not yet being equal to the expense which would be incurred in the production of the salt, which, in such cases, has nearly equalled the

price obtained for it. For this reason they have sold the liquor, and their receipts have consequently been of little value.

M. Chevalet, who for several years has been engaged in the production of ammoniacal salts, has arrived at an arrangement of plant suitable for all kinds of works. For small works it is an almost laboratory form of apparatus. It has the advantage above those employed in large works that the expense of fuel and labor becomes insignificant. Being small, it is easily placed in a corner—for example, in the purifying room, where it prevents the frost entering during the winter. It is also possible to carry out the manufacture during the whole of the year, the apparatus being capable of dealing with more than the daily production of liquor. The method of heating is that of using the waste heat of the ovens, or the simple and ordinary plan of evaporation.

If the producing power of the gas-works is lowered, the waste heat is less, as is also the work of the apparatus. It is also possible to furnish boiling water for general use in the works by means of the apparatus. The work is renewed by simply letting water into the boiler each 12 or 24 hours, according to the extent of the works, introducing the water when it is saturated with ammonia.

When the acid, which has been introduced into the leaden vessel, is saturated, the salt is withdrawn and allowed to drain. This work does not require more than one hours attention per day; the rest of the time there is nothing to do. Consequently, in small works, the cost of labor is insignificant, the total expense of manufacture is consequently reduced to that of the cost of the acid; and if the acid cost 8 francs (say 6s. 6d.) per 100 kilogrammes (or say 2 cwt.) the sulphate of ammonia affords from 10 to 12 francs (say from 8s. to 10s.) per 100 kilogrammes, including all incidental costs. As the sulphate sells at about 45 francs (say 36s.) per 100 kilogrammes, the profit is consequently 33 francs. Works distilling 1,000 tons of coal annually may produce 5,000 kilogrammes of sulphate, showing a large profit. The apparatus is simple, cheap, easily arranged, and has already been adopted in many works about Paris, etc.—*Le Gaz.*

Fuel-Economy—Heated Air in Combination with Steam.

The railways of the United Kingdom consume about 5,000,000 tons of coal a year. It is estimated that the invention of the use of heated air in combination with steam saves 12½ per cent of fuel. This being so, the application of this improvement would save upwards of 600,000 tons of coal per annum, and as coal now costs railway companies on the average perhaps full 20s. a ton, there would be a saving to our railway companies of £600,000 a year. The coal economy referred to would effect a saving to railway companies 50 per cent greater than the total abolition of the passenger duty, about which we have heard so much in late times. The question of the coal saving is therefore a matter of importance.

Richard Eaton read a paper before the British Association, from which we extract:

"In the case of the locomotive named, an air pump, single-acting, driven from one of the main cross heads, and secured to the frame work of the engine, in the place originally occupied by the feed pump, conveys a continuous supply of air, taken from the atmosphere, in its natural state, through a coil of pipes, fixed in the smoke box, into the boiler, at an average temperature of about 650° Fahr. Within the boiler the heated air is distributed, and is continually rising, scattering the cohesion of the molecules of water, increasing the heating surface, promoting ebullition, joining the steam on its passage to the cylinder, and there greatly aiding the energy of the steam by retarding condensation, and following a higher curve of expansion. The action of the heated air also prevents a permanent settlement of incrustation on the boiler, fire box, or tubes, entirely obviates priming, and diminishes the liability to explosion. The duration of boiler, tubes, and fire-box, is prolonged by the non-deposit of scale, and steam is more quickly generated and more easily kept up.—*U. S. R. R. and Mining Register.*

Newspaper Gems and Generalities.

The more a woman's waist is shaped like a hour-glass, the quicker the sands of her life run out.

The water of Lowell's public baths is so poisoned by the refuse from dye-houses, that a number of boys have narrowly escaped dying from a single dip therein.

A Sanatory Creed.—Mahommedanism has been defined as "that blessed religion which makes people wash themselves."

Vegetable Poison.—Observations of garbage receptacles show that at this season the refuse of melons is one of the most active agents in charging the atmosphere with vegetable poison.

Our Recent Drought.—So hard had the ground become from the protracted drought, that for some hours after the rain had begun falling, pools of water formed upon grass-plats in the city parks.

The river at Bridgeton, N. J., swarms with dead and dying fish, killed by the tomato offal thrown into the stream. A pestilence is threatened from the myriads of decaying pike, chub, and sunfish that line the shore.

The contract for the carpenter work on the engine-house of the College Point water works has been awarded to Mr. Thomas I. Tibbs, and that for the mason work to Mr. Robert Williams, provided their sureties prove satisfactory.

More Brimstone.—An English correspondent states that a company has been formed to work the sulphur deposits at White Island, a marine volcano 110 miles from Auckland, N. Z. It is estimated that 100,000 tons of sulphur in an almost pure state are lying on the island ready for shipment.

A party of sixteen ladies were bathing in a group at Long Branch the other day, and a Boston drug clerk who stood near declares that the paint and powder turned the water a bright orange color, for a considerable distance around.

In answer to the complaints of the passengers against the smoke of the locomotives on the Pennsylvania Railroad, Col. Scott asserts that it is the best thing in the world to prevent the spread of fever and ague!

Penn Gas Coal Company.—The company has nearly completed a railroad about ten miles long, from the Pennsylvania at Irwin's, Pa., south by west to the Youghiogheny river and the Pittsburg, Washington and Baltimore Railroad, at the mouth of the Big Sewickley. The arching of the summit tunnel, 600 feet long, is being finished, and it is thought the road will be finished by November.

The Delaware and Lackawanna Railroad and Coal Company are said to be in negotiation for the property and franchise of the New York Bay Ridge and Hempstead Railroad Company, L. I., their intention being to build large barges on which to run their cars, loaded with coal, to Bay Ridge, where the cars can be run upon a track, and thence to any point on any of the roads on the island. It is stated further that the road will be continued to the eastern end of the island, where a depot will be established for supplying coal to eastern cities and sea-going vessels.

Peat Fuel for Manufacturing Purposes.

We were present recently at a domestic trial of the peat coal manufactured by M. Challeton de Brughat's process by the Peat-coal and Charcoal Company. A fire was lighted in the usual way, simply substituting peat-coal for ordinary coal. No inferiority in the important point of "burning up" was manifest, and the regular stages of an ordinary fire were passed through very satisfactorily, the result, after an hour's burning, being a beautifully clear red fire, throwing out great heat, with the smallest conceivable quantity of smoke. A piece of red hot peat-coal being placed upon the hearth, maintained its heat for an hour, when, on breaking, it was found to be still red hot in the centre—a result so noteworthy that we "annexed" a piece of it for a private experiment of our own, which turned out quite similarly. The peat-coal adapted for domestic use is hard, heavy, and compact though "uncompressed." It does not soil the fingers, and it can be carved like hard wood. The price at which it can be produced is about twenty shillings a ton, and as it is stated to go farther than coal, great economy is claimed for it. Except at first lighting, no smell was perceptible, and then only a slight peaty odor, not unpleasant. If the anticipations as to economy are borne out by experience, the introduction of a peat-coal as good as M. Challeton de Brughat's appears to be, will be a great boon to many a household.

The point which is, however, of greatest interest to us is, that a peat-charcoal is also manufactured by the company, which is alleged to be of the highest value for smelting operations. This, as may be guessed, is on account of the great freedom of all charcoals from these objectionable elements, sulphur and phosphorus. A ton of peat-charcoal occupies only half the space of the same weight of wood charcoal of the best quality, and is said to be of somewhat greater heating powers. Its price in England will range between £4 and £6 per ton; in France the prices actually paid were £5 4s. per ton at the manufactory, and £6 to £6 8s. per ton in Paris.

Trials on railways and steamboats in England, France and Germany, have been made with M. Challeton de Brughat's fuel, and have been reported as satisfactory. In the Paris exhibitions of 1855 and 1867, medals were awarded the inventor. Factories are now being erected in England, and by the end of this year the British public will be in a position to see what relief peat-fuel will give them from the difficulties caused by high prices and diminished supplies. By that time we shall probably return at greater length to the subject.—*Iron.*

Carbon Filters.

Kletzinsky describes mixtures adapted to this purpose, one consisting of 63 parts of coke, 10 of animal carbon, 10 of charcoal, and 10 of pipe-clay; another of 10 parts of coke, 30 of animal carbon, 20 of charcoal, and 40 of short-fibered asbestos. The ingredients, except the asbestos, are finely powdered, passed through a sieve, and intimately mixed while dry, and then mixed with as much molasses or syrup as may be necessary to form a plastic mass, about as much as the weight of the dry powder. This dough is well worked, and then formed into cylinders or disks, allowed to dry for some time at a moderate temperature, and then burned in a carefully heated muffle, without access of air. After being slowly cooled, the soluble salts are extracted, and the sulphide of iron decomposed by placing the article in very dilute hydrochloric acid. The filter is then thoroughly washed in running water, dried, and again heated to dull redness, in a well closed muffle, and finally shaped, by turning, as may be desired, for beakers, funnels, etc. Closed hollow vessels can be formed by luting together two suitably shaped vessels of the substance by means of a certain paste. This is prepared by covering the turnings from the washed masses, thinly, with pure syrup (made by dissolving refined sugar in half its weight of water), and triturating them. The edges of the vessels to be luted are first well fitted together, and then coated with the paste, so as also to fill all the seams; and the whole, after drying thoroughly, is to be burned at a dull-red heat. While the fused sugar-carbon affords a vitreous mass, the asbestos and coke and coal give firmness and form the framework. The charcoal removes especially fusel oil and odorous gases, and the nitrogenous animal carbon extractive and coloring matter. Tubes of different materials can be firmly cemented to the filters by plastic sulphur or good cement, such as is made with chalk, clay and water-glass.

Correspondence.

[Correspondents, in all cases, should sign their communications with their names and address in full—not necessarily for publication, but as a guarantee of good faith.—Ed.

Further Testimony on the Dip-Seal.

Citizens Gas Works, Newark, N. J., September 26, 1874.

Mr. Editor: In reading the articles that have lately appeared in the Gas-Light Journal, in reference to the dispensing with the dip in the hydraulic main, I have been much interested in observing the differences of opinion on that subject, and have thought that the experience of one who has some practical acquaintance with some of the substitutes for the dip might possess some degree of interest. It is to be presumed that there is, at this day, no other opinion held by the profession than that the pressure on the retorts during the manufacture of gas should be reduced to a minimum. The use of any of the contrivances for removing the dip, such as for instance, the Gibson Combined Valve and Dip-Pipe, that being one of the best known and most used, is attended with none else than good results. These are—

1st. An increased yield of gas.

2nd. A greater illuminating power.

3rd. The absence or almost entire absence of the deposition of carbon in the retorts.

4th. A saving in *that* wear and tear of retorts caused by subjecting them to the action of a current of air, while in a highly heated state, and the use of heavy iron tools, for the purpose of removing the solid carbon, all of which have a tendency to crack the retorts and render them less serviceable.

5th. A longer life of the retorts and a greater working capacity, arising both from their continuing to be, during their use, of their full original size, and from their being able to be kept in constant service, since there no longer exists the necessity of keeping them out of use for hours or even days, for the purpose of having the carbon burned out, and then of patching them up afterwards.

6th. A less number of retorts are required to accomplish the same amount of work.

5th. The ability on the part of the manufacturer, if he desires to, to obtain a largely increased yield of gas per lb. of coal, with low illuminating power and *low specific gravity*, with a view to its enrichment with naphtha or other cheap enriching materials.

It is held by some gas engineers, who act upon that principle in the retort house, that the exhauster accomplishes all that can be desired in the removal of the pressure from the retorts, but it appears to me plain that such a position is untenable, for the following considerations:

1st. Suppose, for example, that the dip is one inch, and the exhauster is speeded up to cause a vacuum of one inch to overcome the seal on the retorts in use, it is evident that it will also overcome the seal on the retorts *not* in use, with the accompanying result of sucking in any imaginable quantity of air. We all know the evil effects of the admixture of air with the gas—it is expensive; by its serious diminution of the illuminating power of the gas, the use of a larger quantity of high costing enriching coals or other material is necessary, in order to maintain the gas at its usual light-giving standard; it is unprofitable to the company; by its increasing the specific gravity of the gas it diminishes the sales; two evils, either of which are bad enough alone, but when combined are of serious import.

2nd. If the dip *is* overcome by the exhauster, the object is not obtained. In order to avoid all back pressure, the passage of the gas from the dip-pipe must be wholly free and unobstructed, and to this end the tar in the hydraulic main should be at least an inch below the bottom of the dip-pipe. It is useless to say that the exhauster cannot lower the tar in the hydraulic main in that way or to that extent. Even if it could, the bad effects would be manifold; such a vacuum would create a suction in the retorts, which would draw the foul air of the furnaces in through every pore, thus burning up the retorts and producing the same mischief as air from any other source, and adding greatly to the cost of purification. If the tar in the main is near the dip-pipe, the gas in passing out impinges upon it and is driven back, causing resistance and back pressure. The Gibson valve, by making a free passage for the gas at the top of the main, effectually prevents all possibility of any such resistance and back pressure.

3rd. If the exhauster does not entirely overcome the dip, the evil effects of it remain to a degree perhaps unthought of except by a few. A half inch or quarter inch dip is little in itself, and if steady would hardly deserve notice, but yet by the oscillation of the tar in the main and dip-pipe it produces in a remarkable degree the evils which are sought to be avoided. The tar after being driven out of the dip-pipe by the gas returns and rushing up the pipe drives the gas back, which strikes upon the sides of the retorts, forcing the carbon into the pores, and causing the deposits of carbon in nearly as large a measure as a greater dip. It is these sledge hammer blows which do the mischief. Owing to these oscillations, a half inch dip is worse than a *steady* back pressure of several inches, as any one can judge who has seen the action of a pressure gauge placed on a stand pipe or mouth piece, with a dip, steady back pressure, and a level gauge. With a dip the oscillations will at times reach eighteen inches or more.

Mention has been made of the Gibson Oombined Valve and Dip-pipe, not for the purpose of disparaging other contrivances of the same kind, for they all have merit, and the use of one or the other of them is to be recommended. The Gibson valve, however, has qualities which are deserving of attention. It is always safe, if left closed or if accidentally shut, the dip is there as usual; every retort is managed by itself, the valve or dip may be used on one or more at the same time and as may be desired; its action is instantaneous and simple, so that it can be worked by unskilled hands; and it allows a free and unrestricted passage into the hydraulic main.

With reference to the saving effected by the use of these valves expressed in figures, the smallest estimate that can be made in their favor is a gain of 10 per cent. in the yield of gas and illuminating power, or a larger increase in the yield if a high illuminating power is not deemed important; but in this case the gain will have to be effected to the extent of the cost of the enriching material that may be used, *if any*—as the cost of gas per 1000 feet varies so greatly in different places and under different circumstances, it would not be prudent to name any particular amount for an example. Having, however, assumed the cost, 10 per cent of that will show the saving effected by the use of the valves in the cost per 1000 cubic feet, which will give the gain on an assumed sale of say 10,000,000 cubic feet per annum, to which should be added the value saved in labor and in wear and tear of retorts. As a practical illustration of what has been said, the following trial is quoted, it having been made with a view to ascertain the comparative yield of Penn gas coal with the valves and dip used alternately. The trial was made on the 10th inst. with a bench of sixes, 12 inches by 20 inches, charges 150 pounds, the retorts being charged singly every forty minutes; the change from the valves being made and station meter taken at the time of each charging.

Charges of Coal. Lbs.	Total Make. Cub. Ft.	Make per lb. Cub. Ft
With Dips.		
150	770	5.13
150	760	5.06
150	760	5.06
450	2290	5.08 average
With Valves.		
150	830	5.53
150	880	5.87
150	880	5.87
450	2590	5.75 average.

Showing a gain of .67 cubic feet per pound, or more than 13 per cent.

Very truly yours,
J. P. Gill, Engineer.

Gas-Explosion on a British Iron-Clad.

The gas was spontaneously evolved from coal.

The coal was the ordinary service mixture of two-thirds Welsh and one-third North Country; and it had been put into the ship six days before. The bunkers themselves are water-tight, and the bunker-lids are constructed to prevent water passing downward by being accurately fitted to coned seatings, and having a ridge, under which is kept a layer of ordinary oil-soaked gasket.

The bunker in which the explosion occurred is one of the upper tier, and it had not been opened for something like sixty hours before the accident took place. It appears that early in the morning one of the cook's assistants went to the bunker, took the lid off, sat down on the edge of the hole with his feet in the bunker, lowered a naked light, when there was a rush of flame, some little noise, and the unfortunate cook was severely burned about the face and hands. Fortunately the explosion was confined to this one spot, and no other damage was done. A careful examination of the coal was made at once, and there was no trace of damp or heating, the coal was perfectly dry and cool.

When this and the similar explosion of five years ago in the Minotaur are considered, it appears certain that we are continually liable to a similar danger, and very simply. We have only to shut up our coal for sixty hours, and for aught we know are boxing up a most dangerous neighbor, increasingly dangerous the longer and the better he is boxed up.

In some few ships large tubes are led from the upper part of each bunker into the funnel casing well above the water line; and we think that similar fittings should be applied to all ships where the bunkers are made water-tight. Even where the bunkers are not meant to be water-tight, provision should be made for the constant escape of gas in that or some other way.—*Iron Age.*

Coal-Tar and Bricks.

The Detroit *Free Press* says that an architect of that city desired some fireproof brick the other day for the floor of a new barn, but when he learned the cost per thousand he determined to experiment a little with some common brick. He procured a few hundred and had them delivered on the vacant lot on Michigan avenue, between Third and Fourth streets, where they were placed in a large vat, such as the pavers use in which to heat their tar, and allowed to absorb the hot tar for four hours. In that length of time the bricks were as black as the tar itself, and soaked full of it, and when allowed to cool off it was found that their solidity had been greatly increased. A reporter of the *Free Press* struck one of the bricks eight or ten hard blows before he could even break a piece off, and to strike one with a hammer is like striking a rock. Subjected to the same tests as the regular brick, the tar-soaked brick came out finely. To determine their fireproof qualities, a number of the brick were passed into the blazing furnace, and after a severe test they came out without a flaw or a crack; in fact, they were rendered stronger and tougher for the baking, and it was almost impossible to break one. Mr. Lloyd will use the brick thus prepared for the stables, and will then, if the Council grants permission, lay enough of them at some prominent crossing to test their merits for street-paving.

San Francisco Paving.—The so called "hydrocarbonized brick," saturated with coal tar, in California, we have before referred to. We learn now, through the *U. S. R. R. and Mining Register* that this kind of paving material was accidentally discovered by Philip Caduc, a well known street contractor of that city, about seven years ago. An ordinary brick was carelessly dropped by him into a vat of boiling coal tar, where it remained over night. On taking it out the discovery was made that it had increased very much both in hardness and weight. On ap

plying it to a grindstone it was found that its character was so altered that it opposed as much opposition to attrition as piece of granite. Some experiments were then made which resulted in perfecting the process by which the hydrocarbonized brick is now prepared. That process consists simply in boiling ordinary bricks, for the period of 24 hours, in a solution of coal tar mixed with a little sulphur and pure asphalt. At the end of that time the brick will have gained from a pound and a half to two pounds in weight, from being thoroughly impregnated with hydrocarbon. The cross section made by breaking is dotted thickly by little globules of the above compound. A great deal of elasticity is also noticeable in the substance, enabling it to withstand a crushing weight surprisingly well. These two qualities—hardness and elasticity—are the points of excellence especially claimed for the paving material prepared in this manner.

Purifier for Coal Gas.

COLLADON.—Gas requires to be freed from particles of solid matter, naphthaline, coal-tar, ammoniacal salts, etc., as well as from gases such as carbonic and sulphurous acids. For washing it vessels have been employed similar to Woolf's bottles, in which the gas traverses water or a suitable solution through a metallic network, in the form of bubbles or continuous currents. This arrangement is insufficient for working on a large scale; because the bubbles of gas take a spherical form, and consequently present a minimum of surface for a maximum volume. Further, this method requires a decided increase of pressure, which is inconvenient. Chemical "cascades," in which the gas passes upwards through a fine rain of the washing liquid, act much better, but require too large a quantity of liquid. Coke-towers (scrubbers) produce a more complete effect, but the action is irregular. The new mechanical washing apparatus has the advantage of producing very powerful action without requiring large dimensions. At Geneva it yields coal-gas, superior both in illuminating power and in a sanitary point of view. Less purifying matter is also required than on the old system. The same apparatus will doubtless prove useful when it is required to saturate a gas with the vapors of a liquid, *e. g.*, hydrogen with the vapor of petroleum. The system rests on this principle, that the best arrangement either for washing a gas or for saturating it consists in making it strike, in the form of currents as thin as possible, against solid walls kept perpetually moist. The currents are broken against these surfaces, and are prevented from moving on in a straight line. The gaseous particles are thus always kept in a rotatory movement, and are pressed against the moist walls, so that they may either absorb the substance diffused over these walls or may deposit there a part of their own substance, according as it is required to saturate the gas or to wash it.—*Acad. of Sciences.*

On a New System of Photometry for Gas—The Differential Photometer.

By DR. WALLACE, Gas Examiner for Glasgow.

Preliminary Notice.

The results of an extensive series of experiments in which I have been engaged on the influence of pressure on the illuminating power of gas, some of which were published in a recent number of the *Journal of Gas Lighting*, have led me to propose a new system of photometry which promises to be useful, especially to practical gas makers. It is founded on the fact that, while gas of high illuminating power (say 25 candles) suffers little or no diminution of photogenic power by being burned at a high, as compared with a low pressure (1·5 inch as against ·3 inch), that of low quality (say, 15 candles) gives only half the light at the high pressure that it does at the low. By burning the same gas, therefore, at the two ends of an ordinary photometer, the pressure at the one being regulated to ·5 inch, and at the other end to 1·5 inch we have the means of deducing, by a single observation, the quality of the gas tested, provided always that a scale is previously prepared. That scale I have not yet constructed, but, from the observations I have already made with different qualities of gas, I think that 1 on the ordinary photometer bar will represent about 35 candles, and 2 about 15 candles. This, on the 100-inch bar, gives a range of 8½ inches, while the range on the bar from 15 to 35 candles is less than 6 inches. The delicacy of the test, therefore, will be at least equal to that obtained when candles are employed as the photometric standard.

The apparatus will consist of an ordinary 100-inch photometer, with gas jets at each end; and I employ a Bray's union jet No. 8 for the ·5-inch pressure, and No. 4 for the 1·5-inch pressure, the cloth stuffing being removed from both. In the centre is a wet double meter, working on the same spindle, supplying 5 cubic feet per hour to both jets, the necessary change of pressure being obtained by two balance governors. The initial pressure of the gas should be about two inches.

The principle I have pointed out affords an explanation of the fact that, while obstructed burners of various kinds show a very large increase of light with common, or 15 candle gas, amounting, in some cases, to nearly 100 per cent., with cannel gas of 25 to to 26 candles they give an increase of only twenty or thirty per cent.

While working on various qualities of gas, I tried to obtain low qualities by mixing air with ordinary gas, but I found that the results were useless and misleading, the difference in illuminating power by employing a high pressure being immensely increased by the admixture of air. This explains the fact that air gas, made by mixing air with the vapor of petroleum spirit, must be burned at an excessively low pressure (·1 to ·2 inch) in order to obtain a satisfactory result. —*London Journal of Gas-Lighting.*

Electric Light.—The London *Daily News* says: Some curious and useful information about the lights displayed from the clock tower of the Houses of Parliament is given in a report just made to the House of Commons. It appears that the two semi-lanterns which a spectator at Westminster sees 250 feet above him in the clock tower, are in the hands of two rivals —one of whom employs gas, and the other electricity, as the source of illuminating power. The Wigham light has three burners, each composed of 108 jets, placed one above the other on the same axis. The electric light is produced by an electromagnetic machine, worked by steam power, the currents being conducted from the machine to the lantern along 1,700 feet of copper wires. The report is decidedly favorable to the electromagnetic process. Thus Mr. Douglass states that the electric light has a superior intensity of 65 per cent. when one 108 jet burner is employed. So, again, as to cost; the electric method produced a saving of 162 per cent., measured in cost per candle per hour, when a 108 jet gas burner is used, and of 133 per cent. when three burners are used. —*Sci. Am*

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FRIDAY, OCTOBER 2, 1874.

WISHING TO MAKE THIS JOURNAL an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of these subjects a pleasure, or a profession.

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CIRCULAR.
THE GAS-LIGHT ASSOCIATION.

The Secretary of the Association, Mr. P. E. Demill, desires that it be announced that the place of rendezvous of the delegates of the Association and of all desiring to attend the grand meeting in Brooklyn on the 21st of this Month, will be at the ASTOR HOUSE in this city; where the Secretary will provide rooms for the purpose, and where every information will be furnished in relation to the Association and its meeting.

[It is to be hoped that the above may prove to be sufficiently prominent to attract the notice of every member of the gas fraternity. One year ago this day, the Editor, who then enjoyed the honor of the Secretaryship of the Association, caused to be inserted a similar announcement, in the editorial columns, appointing a public place of rendezvous at one of our large hotels. To his astonishment, some gentlemen, through failing to observe it, were stated to have *failed in finding* the meeting of last October. Hence the extreme prominence we now give to the above. Let us trust that the possibility may thus be avoided of any like misfortune this time.]

WATER-SUPPLY QUESTIONS IN NEW JERSEY.

The time has now come when questions of urban and oppidan water-supply will rise, and increase and multiply, upon this continent; and will be complicated with considerations of contamination and pollution by drainage from towns, swamps, cultivated lands, mines, factories and cemeteries; insomuch as to call for the most advanced and profound knowledge and skill in chemical and sanitary investigation, together with the recording and sifting of vital and mortuary statistics of our whole people to an exhaustive extent.

This Journal has always been the sole exponent in America of this class of subjects; so far as they have arisen—and now that they are about to assume the importance and prominence rightly due to them, in every civilized land, it will fall upon us to assign such space and attention to them as they may justly claim.

It happens that the first serious imbroglio of this kind that has been stirred up, so far, is one which concerns a large section of our population in Northern New Jersey, so closely connected with the metropolis by business, social, and other ties, as to constitute virtually but a suburban portion of the same. This population is that of the Counties of Hudson, Union, Essex, and Passaic, in New Jersey; including the large towns of Newark, Elizabeth, Jersey City, Hoboken, Paterson, Orange, Bloomfield, and many other smaller places, in all comprising already probably 350,000 souls, and increasing at an important rate.

Of these towns, four of the largest, Paterson, Newark, Jersey City and Hoboken, are supplied with water pumped from the river Passaic. Of these the last three, combining near a quarter of a million people, get their water by pumping from the lower estuary of that stream, in which the tide ebbs and flows, to and from Newark Bay.

Nearly two years since, the Editor of this Journal was commissioned to examine chemically into the substantiality of certain complaints, public and private, that had for some time existed, of an unwholesome condition of the water at times, from contamination by drainage, chiefly, as was supposed by the complainants, from waste products of factories at Paterson and elsewhere.

An immediate and unanticipated result of this preliminary investigation was that the up-flowing tide takes up the sewage of the 120,000 inhabitants of Newark, and sweeps it up-stream past the pumping works, so that it is received back again, and again imbibed by the citizens of that place, as well as by those of the other towns supplied from the same source. Though it was concluded that it was improbable that any serious disease had up to that time arisen from this bad state of things, great misgiving was nevertheless expressed, and urged upon all concerned, regarding the near future. It was pointedly remarked that "there seems no good reason to deduce the slightest confidence or belief in an indefinite, or even a long continuance of this immunity."

In this issue of this Journal there is copied the substance of an investigation by the French chemist Gerardin, of a French river; in which is rated as a great discovery the indication to be derived from the action and amount of *free oxygen* in the water; but it will be found that his observations, reasonings and conclusions on this head, were all substantially anticipated in the report above referred to, of two years since. The general conclusion of this Report was that it was advisable to continue the investigation much further.

Accordingly, during the year 1873, there occurred first some legislation; on the basis of which the investigation was resumed to a certain extent, and in October of that year another report was submitted to the joint authorities of Newark and Jersey City, by the Editor of this Journal. The general results of a somewhat extended series of analyses were that the pollution of the Passaic water by sewage, at different points in its course, and the mitigation, or entire removal, of the contamination by the three agencies of oxidation, fish-life and plant-life, were easy to follow up, by correct application of our present new methods of water-analysis, and particularly by the exquisite methods of Wanklyn and Chapman, now just coming into use. The general average amount of residual "albumenoid" matter, that escapes the different mitigating agencies, and is therefore pumped up into the reservoirs and distributed for consumption, was proved to be much beyond that deemed by experienced water-analysts safe and admissible in a permanent water-supply source.

Examinations were made also of some of the tributaries of the Passaic; though this part of the investigation necessarily fell far short of what is desirable for the complete settlement of the questions that arise regarding the full measures to be taken to cure the trouble. It happens, by what may almost be truly deemed a Special Providence, that in this case there is a *canal*, traversing the Passaic water-shed from west to east, into which any or all of the head-waters of the river may be gathered, and which could scarcely have been better located or contrived, as an aqueduct, had that end been in view in its projection. A level of this canal which is no less than 174 feet above tide, terminates at Bloomfield, within a few miles of the section whose water-supply is in question. This canal, one of earliest in the United States, has apparently chiefly outlived its usefulness as a channel of transportation, and its prospective value as a means of water-supply is so grandly obvious that attempts have even been made in past years by

speculators to acquire it for the use of the great city of New York itself. Which of the higher sources of the water-shed it will be advisable to gather together into this canal for the supply of the great and populous municipality which is soon to be organized out of the different trans-Hudson cities, can by no means be regarded as settled, and will be an appropriate subject for extended investigation, chemical, geological and topographical. That its adoption as an aqueduct is inevitable, is so clear, however, from the chemical and engineering investigations already made, that those who still oppose it, from various motives of interest and prejudice, will find their efforts, as we believe, altogether futile, and an absolute waste of energy.

It has also been satisfactorily settled by the estimates of the skilful engineers who have examined into and reported on this matter, that, in view of the great and increasing cost of pumping up the water, as well as of bridging and caring for the canal, where it traverses the two main cities, the adoption of this canal aqueduct will in a very few years save money enough to cover its cost. This, however, is a consideration that is trifling compared with the economy of health, and of life indeed, which is destined herefrom to accrue to this important section. In future issues we shall have several things to add on this general subject, besides some special remarks relative to local issues arising out of, or connected with it.

THE COMING ASSOCIATION MEETING.

Much may naturally be expected of the meeting of the Gas-Light Association in Brooklyn on the 21st of this month of October. This will be the second Annual Meeting, the first having occurred on the 16th and 17th of October of last year.

Much disappointment arose on the earlier occasion, from an apparent lack of appreciation, on the part of many of the profession (particularly throughout the Eastern and Middle States) of the objects, interest and importance of the Association; and it was perfectly natural for many distinguished members of the fraternity from the west, who came long distances to attend, to feel disheartened and even justly hurt, when they found that the meeting was ignored and unattended by gentlemen who were close to the spot.

There is certainly good reason to hope and believe that on the coming occasion it will be found that a great change and a great improvement has come about in this regard. Our strongest hope in this direction is founded reasonably upon the fact that at the semi-annual meeting in Cleveland last May, many gentlemen from the East, and even from New England—although in the latter section a local Association exists—made the journey and were present. It cannot but be, also, that many more of our eastern friends will, by this time, have considered and become convinced of the advantages, both moral and material, that must arise out of the Association; for the profession generally, and hence for each and every member thereof. These advantages were oft and again pointed out by us in the progress of the agitation and advocacy, in advance, in these columns, of the creation of a National Association; which we shall always flatter ourselves we were largely instrumental in bringing about. These advantages we are still sure will all come in due time. A Continental organization of a great guild cannot be born perfect in a day, as Minerva sprang from the brain of Jove in the days of fable—nor yet in a year, can such a great temple be erected—a temple which will indeed be *always* building and strengthening, throughout the time to come—till time shall be no more. Let none of us feel a moment's discouragement while we know we are in the right way; but rather let each strive to carve out and add his own stone to the fabric, which thus shall inevitably, though possibly almost imperceptibly, grow large and strong and grand, like the structures of the coral polyps, the architects of continents.

[Editorial Note.—Since the last issue, the Editor has been for the first time informed, through a private letter from the Secretary, that an invitation was extended to himself, by resolution at the Cleveland meeting, to address the Association on some topic of current interest to the profession. This invitation he therefore thankfully accepts.]

TYNDALL AND ADOLPHE WURTZ.

Tyndall, like Laplace, "finds no necessity for the hypothesis" of a personal God: as by this time everybody knows—or probably, not to do him injustice, he is inclined to invest in *matter* the creative and sustaining powers which the devout attribute to God. The world nevertheless must not believe that Tyndall's authority is going to be sufficient to convert the scientific world altogether to a godless state of mind. The great French chemist, Adolphe Wurtz, who as a fertile scientific worker and trainer, and as a sound intellectual thinker and leader of thought, ranks much higher than Tyndall, made use of words in his recent address as President of the French Association for the Advancement of Science, which we may fairly set against the proud periods of Tyndall.

"Chemistry, natural philosophy, and astronomy, though diverse in methods, yet have one common object, matter, and one common goal, the knowledge of its constitution, properties, and distribution. Thus are we taught that the worlds which stud boundless space are constituted like our solar system and move like it. But a novel and wonderful feature is that the harmony of celestial spheres, which Pythagoras has celebrated and modern poetry has described in immortal verse, is also found in the smallest of microcosms. Among the infinitely little all is in co-ordinated motion. The atoms whose aggregate constitutes matter are never at rest. With regard to matter, it is ever and everywhere the same, and the hydrogen of our earth's water we trace in our sun, in Sirius, and in those nebulosities which are still unformed worlds. Everywhere is motion, too; and motion, which appears inseparable from matter, is the origin of all physical and chemical force. Thus, from under the edge of the veil which we are enabled to lift, a glimpse is revealed to us of the harmonious plan of the universe. As for primary causes, they lie within another domain which man's intellect will ever strive to enter and search. In vain does science reveal to him the physical structure of the universe and the order of all its phenomena. Excelsior! He will strive onwards and upwards in his innate instinctive conviction that things have not within themselves their raison d'etre, their foundation and origin; he is gradually led to subordinate them to a primary cause, an unique and universal God!"

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Coal-Deterioration in the Air.

We condense as follows from our valued contemporary, the *Journal of Applied Chemistry:*

A series of such experiments has actually been made in Germany on a large scale, the results of which are published in the *Zeitung des Vereins Deutscher Eisenbahnver-waltung.* The coals experimented on had lain out for a year. The results, which we publish below, vary greatly with the variety of coal:

1. English Peases West coking coal suffered no loss in weight or heating power.

2. Coal from the Heydt mine, near Ibbenburen, lost 1.4 per cent. in weight, 6 per cent in heating power, and 4.6 per cent. in yield of coke.

3. Coal from the Carl mine, at Dortmund, lost nothing in weight, but lost 2.6 per cent. in heating value, and 2.1 per cent. in yield of coke,

4. Coal from Hibernia mine, at Gelsenkirchen, lost 0.4 per cent. in weight, 0.6 per cent. in heating power, and 2.1 per cent. in yield of coke.

5. Coal from Constantine mine, at Bochum, lost 0.4 per cent. in weight, the same in heating value, and nothing in yield of coke.

6. Coking coal from Borgloher, near Osnabruck, lost 2 per cent. in weight, 6 per cent. in heating value, and 0.5 per cent. in yield of coke.

From these experiments it will be seen that, on the average, there is a decrease of weight, heating power and yield of coke produced when the West German coals are exposed to the weather. Tests made at the end of two years will probably show a considerably larger decrease of weight, heating power, etc. It is to be hoped that a series of such experiments will be at once undertaken with other coals, especially with the best known English and American specimens.

Pacific Soundings.—The Tuscarora, Geo. E. Belknap commander, arrived in San Francisco recently, from a sounding expedition for cable-laying purposes between that port and Japan, on which duty she started one year ago, Sept. 2d. During that time she has run 14,000 miles of soundings. The first line was run from Cape Flattery toward Ounalaska, but owing to the lateness of the season, was abandoned, and lines were then run off and on the coast from Cape Flattery to San Francisco. Again, in December, she started out on a second trip, running lines off and on shore to San Diego, and a trans-Pacific line was run via Honolulu and Bonin Islands to Yokohama. The deepest water found on this line was 3,287 fathoms. A line was then started from Yokohama to connect with the Cape Flattery line, commenced last fall. Two lines were started from the Japan coast and abandoned on account of the great depth of water. The third line proved feasible, and was continued along the Kunile Islands to the Island of Kanaga, one of the Aleutian group; then to Ounalaska, and thence to Ounimak Pass to Cape Flattery. The greatest depth of water found was 4,645 fathoms, or five and a quarter miles. This is the greatest authentic depth yet sounded. The greatest depth found on the line finally surveyed was 4,037 fathoms.

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Liverpool caking	11 50	@	12 00
British Province Coals.			
Pictou			2 50
Block House—At Mines, $2 12, Gold			0 00
Caledonia—At Mines, $2 00, Gold			0 00
Little Glace Bay—At Mines, 1 87½, Gold			2 00
Lingan—At Mines, $2 25, Gold			0 00
Sydney—Old Mine			3 00
" Reserve Mine			2 25
" International			— —

(Duty, 75 cents per ton, gold. Freight to New York $2 25, currency. Cost of above coals delivered in New York, $5 25 @ $6 00½, currency.)

Pennsylvania Coals.			
Penn Gas Coal—At Amboy	$7 00	@	0 00
Westmoreland—At Amboy	7 00	@	0 00
(In New York both the above coals $7 50)			
Shafton	7 50	@	0 00
Youghiogheny	7 75	@	0 00
West Virginia Coals.			
MurphyRun	$7 40	@	0 00
Despard	7 40	@	0 00
West Fairmont	7 40	@	0 00
American Gas Coal	7 40	@	0 00
Fairmont	7 40	@	0 00
Newburgh Orrel	7 40	@	0 00
Pinnickinick	7 40	@	0 00
Cloverhill of Virginia	6 00	@	6 50
McKenzie Compound Mixture			— —
American Cannel Coals.			
Peytona of West Virginia	$12 50	@	00 00
Darlington of Pennsylvania			— —
Cannelton Cannel			12 50
Red Bank—at Philadelphia			7 60
" —at South Amboy			9 00
Asphalts.			
Albertite of New Brunswick	$— 00	@	— 00
Ritchie Mineral of West Virginia	18 00	@	at Bait'e.
Trinidad Bitumen	— —	@	14 05

The Waverly Coal and Coke Company of Pittsburgh, have contracted with the Pittsburgh Gas-Light Co. for 40,000 tons of their Youghiogheny coal on private terms.

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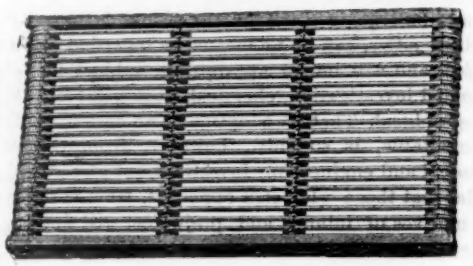

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PATENTED AUGUST 4, 1874.

It regulates the speed of Exhausters by controlling the fire. The least pressure on the Retorts opens the Damper in the Boiler Chimney and under the fire, and closes them as soon as the pressure is removed. Saves the boiler, fuel, and all attention, except to supply the fire. Come and see it, or address JAMES SLADE,

Gas Works, Yonkers, N. Y.

KIDD'S

Gas Consumers' Guide

Enables every Gas Consumer to ascertain at a glance, without any previous knowledge of the Gas Meter, the quantity and money value of the Gas consumed. Also the best method of obtaining from Gas the largest amount of its light.

It will be to the advantage of Gas Companies to supply their Consumers with one of these Guides, as a means of preventing complaints arising from their want of knowledge in regard to the registration of their meters. For sale by

A. M. CALLENDER & CO.,

42 Pine Street, New York, Room 18,

MANUFACTURERS OF MACHINIST'S TOOLS OF EVERY DESCRIPTION — NEW YORK STEAM ENGINE CO. — 98 CHAMBERS ST. N.Y.

Having added a

SCOTT'S GEAR MOULDING MACHINE

To our Foundry, we are now prepared to furnish,

WITHOUT CHARGE FOR PATTERNS,

GEAR-WHEELS

OF ALL DESCRIPTIONS,

AT THE

SHORTEST NOTICE.

Work warranted perfectly accurate. Send for circular giving price, and directions for ordering.

N. Y. Steam Engine Co.,

98 Chambers St.,

N. Y.

P. P. DEILY, J. FOWLER.

1842. *1874.*

DEILY & FOWLER,

39 LAUREL STREET, PHILADELPHIA, PA.

Builders of Gas Works.

MANUFACTURERS OF

GAS-HOLDERS,

Single and Telescopic.

WROUGHT IRON ROOF FRAMES,

COAL WAGONS,

COKE BARROWS,

AND ALL

Wrought Iron Work

CONNECTED WITH GAS WORKS.

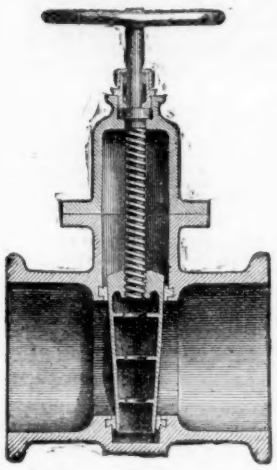
☞ Particular attention paid to Extensions and Repairs.

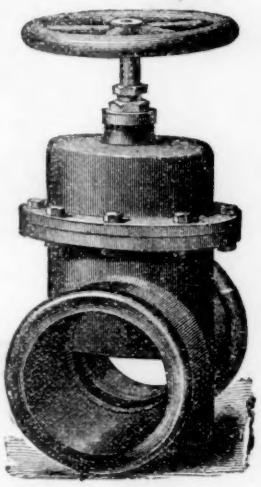
CHAPMAN VALVE COMPANY.

MANUFACTURERS OF

CHAPMAN GAS VALVES.

Office and Sales Room 75 and 77 Kilby Street, Boston.





These Valves have been in use for several years, and are pronounced by all who have used them to be

The Best Gas Valves Ever Made.

They afford a direct passage the full size of the pipe. The seats are made of an alloy similar to BABBITT metal, specially prepared for the purpose, and superior to all other metals used for the seats of Gas Valves. It does not corrode under any circumstances to which it is exposed.

There is no LIABILITY OF COHESION between the Gate and Seat, and the Valves can be relied upon to SHUT TIGHE and OPEN EASILY at all times—an important desideratum when used for street mains, in cases of fire.

We refer to the following named Gas-Light Companies among the many that have used these Valves:

BOSTON GAS-LIGHT COMPANY, BOSTON, MASS.
CAMBRIDGE GAS-LIGHT COMPANY, CAMBRIDGE, MASS.
NEWTON & WATERTOWN GAS-LIGHT CO., WATERTOWN, MASS.
LAWRENCE GAS-LIGHT COMPANY, LAWRENCE, MASS.
PEOPLES GAS-LIGHT COMPANY, BROOKLYN, N. Y.
CITIZENS GAS-LIGHT COMPANY, BROOKLYN, N. Y.
SOUTH BOSTON GAS-LIGHT COMPANY, BOSTON, MASS.
CHARLESTOWN GAS-LIGHT CO., CHARLESTOWN, MASS.
LYNN GAS-LIGHT COMPANY, LYNN, MASS.
FITCHBURG GAS-LIGHT COMPANY, FITCHBURG, MASS.
CITIZENS GAS-LIGHT COMPANY, NEWARK, N. J.
WILLIAMSBURGH GAS-LIGHT CO., WIRLIAMSBURGH, N. Y.

GAS AND WATER VALVES ½ INCH TO 36 INCHES DIAMETER.
STEAM VALVES ½ INCH TO 12 INCHES DIAMETER.
357-tf

CANNELTON COAL COMPANY

Of West Virginia,

Offer to Manufacturers of Gas the pure Cannel Coal from their Colliery at Cannelton, West Virginia. This coal after having been thoroughly tried by the most expert and reliable Engineers, has shown itself to be the most valuable **Enriching agent** produced in this country—a gross ton yielding **10,000** cubic feet of gas, of **64.54** candle power, to purify which, required only two bushels of lime. The yield of coke is **32 bushels** of good quality, quite light, burns freely, making a very hot fire. For further information address

J. TATNALL LEA, Treas.,
P. O. Box 1747. No. 325 Chestnut Street, Phil'a.

PEYTONA CANNEL COAL

From West Virginia.

Yields over **13,000** feet of Gas per ton. At ten thousand feet (standard yield) the illuminating power s over **43** candles. Purifies **4,510** feet to the bushel of lime.

S. E. LOW, Secretary,
354 Office, 58 Broadway.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

Entrance Examinations June 1 and 2, and Sept 23 and 24. For new Catalogue and late Entrance Examination Papers apply to PROF. SAMUEL KNEELAND,
255-12t Secretary, Boston, Mass.

PROVIDENCE Steam & Gas Pipe Co.,

PROVIDENCE, R. I.,

BUILDERS OF

GAS WORKS

AND

GAS-HOLDERS,

RETORT HOUSE ROOFS,
PURIFIER COVERS,
COKE BARROWS,
WATER TANKS.

Particular attention given to

Enlarging and Rebuilding Gas Works.

PRINCIPAL OFFICE AND MANUFACTORY CORNER PINE AND EDDY STREETS. PROVIDENCE, R. I.

FREDERICK GRINNELL, President, J. C. HARTSHORN, Treas,
F. H. MAYNARD Secretary.

CHICAGO OFFICE, 103 WASHINGTON ST., CHICAGO, ILL.
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RILEY A. BRICK & CO.,

MANUFACTURERS OF

CAST IRON PIPES,

FOR WATER AND GAS,

ALSO,

GAS WORKS AND MACHINERY CASTINGS

OF EVERY DESCRIPTION,

No. 112 Leonard Street, New York.

RILEY A. BRICK. JAS L. ROBERTSON

AMERICAN GAS WORKS CONSTRUCTION AND *Supply Company.*

President—JAMES A. TAYLOR, Columbian Iro Works.

Engineer—A. F. HAVENS, late of Brooklyn Ca Light Co., Patentee of the following inventions:

HOISTING ENGINES,
COAL ELEVATORS,
WIRE-ROPE RAILROAD,
TRAYS FOR LIME OR IRON
RETORT CHARGING AND RAKING MACHINE,
RETORT SETTINGS,
SELF-SEALING LIDS,
AUTOMATIC DIP-PIPE SEAL
SECTIONAL PURIFIERS.

The above Patents are the result of many years experien and are of great value, enabling any Company to incr the capacity of its Retort and Purifying Apparatus 15 to 50 per cent without change, and at slight cost.

Plans, Specifications, and Details furnished of all Appar tus, and Companies supplied with every thing required in Gas Manufactura, from the greatest to the least, at the lo est market rates.

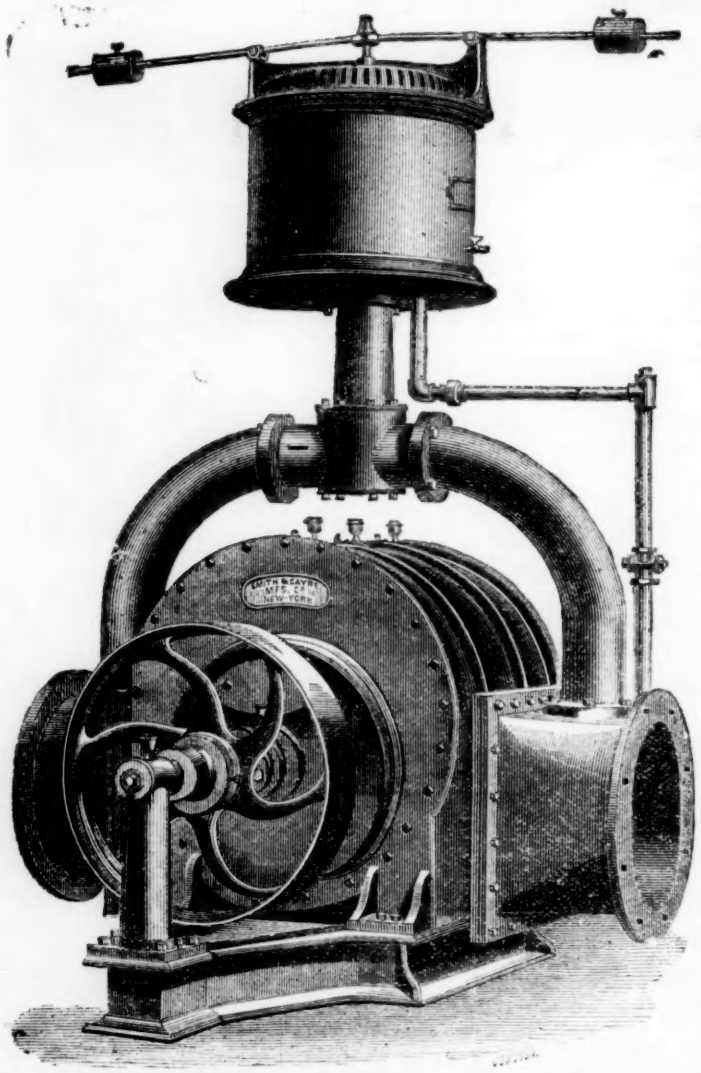
American Gas Works Construction and Supply Company,
No. 34 Dey St., N. Y.

☞ Mr. HAVENS can be consulted on all matters appertaining to Gas and its manufacture, gratis.

SMITH & SAYRE MANUFACTURING COMPANY.

The Mackenzie Patent Gas Exhauster

And Patent Compensator.



They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts, either clay or iron. The Compensator obviates entirely the necessity of water-joints, compact, durable, cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

We are also sole proprietors and manufacturers of the

MACKENZIE PATENT BLOWER, PATENT CUPOLA AND SMELTING FURNACE.

The Blower is a Force Blast machine, durably built, and can be driven with one-third the power required to drive the ordinary fan.

The Cupolas are manufactured in sizes to melt from 1 to 30 tons per hour, will save one quarter of the time required by the old style Cupola, and 33 per cent fuel. Address

CHARLES W. ISHELL, Secretary. JAMES M. SAYRE, Treasurer. G. G. POKTER, President.

OFFICE, 95 LIBERTY STREET, New York.

AMERICAN

GAS SCREEN MAN'F'G COMPANY.

TO GAS-LIGHT COMPANIES.

Your attention is respectfully called to the GAS SCREEN now being manufactured by the American Gas Screen Manufacturing Company, under the patents granted to E. DUFFEE, and are pleased to submit the following points of their excellence and superiority over all other screens now in use.

The Screen is made with an oak frame, interlaced with split rattan, drawn through holes at regular intervals in the Frame and cross-pieces, the edges of the frame being grooved to prevent abrasion.

The advantages of the soreen are:

1st. The large purifying surface, the construction of the Screen giving over three-fourths of the surface for the gas to penetrate the lime.

2d. On account of the free passage of the gas through the screen the pressure is reduced, thereby preventing the accumulating of carbon on the retorts.

3d. The saving of lime and labor, as the Screens are not liable to clog, and are easily cleaned.

4th. Their cheapness and simplicity of construction.

5th. Their DURABILITY—they can be used longer than any other now used.

Testimonials.

PROVIDENCE, RHODE ISLAND, March 21st, 1872

E. DUFFEE, Esq., Agent, etc.

Dear Sir: The Trays manufactured by you for our West Station were put in use in September last, and have *given perfect satisfaction.*

The frames are well put together, and I see no reason why hey will not last for a long time. The *very large amount of* pen space in these Trays gives the gas an easy passage, and brings it into contact with the lime much better than wh the space is so contracted, as is the case in most of the other Trays in use.

The pressure thrown upon the retorts by contracted passages is very great, and were gauges used more frequently than they now are in many gas-works, this facat of having *open Trays* would become more apparent to mangers of gas works. The digerence in pressure at this station in passing the gas through your purifiers, is two-tenths (2-10) inches.

The amount of gas purified, per bushel of lime used to this date, is six thousand five hundred and fifty six (6,556) cubic feet.

Respectfully yours,
JAMES H. ARMINGTON, Supt.

BOSTON GAS-LIGHT CO., Dec. 1871.

Dear Sir: In answer to your inquiry how we like your Patent Tray for dry gas purifiers, I take pleasure in saying we have used them exclusive of all others, for the last three years, and think them far ahead of any yet offered. The surface being nearly three times that of any other Tray, and their lightness and durability perfectly satisfactory.

Yours respectfully,
A. M. GILES.

EDWARD DUFFEE, Esq.

EAST BOSTON, JUNE 15, 1871.

Gentlemen: We have used your Screens some five years. They give perfect satisfaction.

I consider them *by far the best Screen* for Dry Lime Purifiers I have seen. Yours truly, A. M. NORTON, Supt.

CHELSEA, May 1, 1871.

Mr. E. DUFFEE.

We are using your Purifying Trays, and find them to be the *best of any* that I have used, and will *purify more gas with less pressure* than any tray that I know. I can fully recommend them, after four years trial, to any Gas Superintendent with perfect safety, as the *cheapest and best Tray made.*

Yours truly, JOHN ANDREW, Sup't.

DORCHESTER, March 3, 1870.

Mr. E. DUFFEE.

Dear Sir: We have had your Gas Trays in constant use for almost one year and six months and find them superior to any others we have ever used, both in point o economy and efficiency. Truly yours, W. B. BROOKS,
Agent Dorchester Gas-Light Co.

JAMAICA PLAINS, MASS., June 21, 1871.

EDWARD DUFFEE, ESQ.

Dear Sir; The Trays ordered by this company three years ago, are getting somewhat worn. I wish to say here that I consider your Trays to be superior to any yet invented, therefore please make us another set at the price named, to be like the sample shown in every way, and oblige Yours truly
JAMES F. ROGERS,
Sup't Jamaica Plains Gas-Light Co.

BROOKLINE, June 11, 1871.

E. DUFFEE, ESQ.

Dear Sir: You will please make a set of Gas Trays for this company as soon as convenient, at price named. In regard to the merits of the Tray, after having them in constant use for over two years, I will say that I consider them *superior to any Tray* manufactured in this country. Respectfully yours,
H. A. ALLYN,
Sup't Brookline Gas-Light Co.

BANGOR, August 2, 1870

EDWARD DUFFEE, ESQ.

Dear Sir: Yours of the 20th ult. is received. In regard to your Gas Trays, I take pleasure in saying that they have been in use over two years, and have given perfect satisfaction and they are in good order at the present time; should have no hesitation in recommending them, believing they are the most durable and easiest kept in order of any with which I am acquainted. Respectfully yours,
W. H. PERRY, Sup't.

OFFICE OF THE SPRINGFIELD GAS-LIGHT CO.'
SPRINGFIELD, MASS., Oct. 10, 1871.

Mr. WARD,
President Hartford Gas-Light Co.

Dear Sir: I have been using Gas Screens made by the American Gas Screen Company, for nearly a year, and find them superior in every way to the wooden Screens made and formerly used by the Springfield Gas-Light Co. I can purify more gas with the same quantity of lime, there being more surface to the Screens; and I consider them more durable. and recommend them to your consideration.

Yours with great respect,
GEORGE DWIGHT.

ROXBURY, June 14, 1872.

EDW. DUFFEE, ESQ.

Dear Sir: In answer to your inquiry regarding your Patent Gas Screens, I am happy to be able to say, that after nearly three years constant use we are perfectly satisfied with them being able to purify over fifty pet cent. more gas with them than with any other Screen we have used.

Yours respectfully,
THOMAS J. PISHOU

OFFICE DETROIT GAS-LIGHT CO.,
DETROIT, MICH., April 22, 1872.

AMERICAN GAS SCREEN MANUFACTURING CO., HAVERHILL.

Gentlemen: The Screens bought of you work far better than any we have ever used. As a proof, we have with the same quantity of lime purified *twenty per cent.* more gas with your Screens than with any others, and the work well done. The workmen are also better pleased wifh them—they being light and handy to work. They also relieve the pressure very much upon the retorts, and I cheerfully give yau my experience.

Yours truly,
P. E. DEMILL. Secretary.

We give a list of some Gas.Light Companies using them.

Providence, R. I. Gas-Light Co.. Boston, Mass. Gas-Light Co.: East Boston, Mass., Gas-Light Co.; South Boston, Mass. Gas-Light Co.; Springfield, Mass., Gas-Light Co.; New Bedford, Mass., Gas-Light Co.; Manchester, N. H., Gas-Light Co.; Reading, Penn., Gas-Light Co.; Biddeford, Me., Gas-Light Co.; Hartford, Conn., Gas-Light Co.: New Haven, Conn., Gas-Light Co.; New Orleans, La., Gas-Light Co.; Savannah, Ga., Gas-Light Co.; Charleston, S. C., Gas- Light Co.; Trenton, N. J., Gas-Light Co.; Charlestown, Mass., Gas-Light Co.; Dorchester, Mass., Gas-Light Co.; Chelsea, Mass., Gas-Light Co.; Baltimore, Md., Gas-Light Co.; Manhattan, N. Y., Gas-Light Co.; Cincinnati, Ohio.; Gas-Light Co.: San Francisco, Cal., Gas-Light Co.: Albany, N. Y., Gas-Light Co.; Sacramento, Cal.; St. Joseph, Mo., Gas-Light Co.; Leavenworth, Kansas, Gas-Light Co.; Macon, Ga., Gas-Light Co.; Roxbury, Mass., Gas-Light Co.; Lansinghburg, N. Y., Gas-Light Co.; Bridgeport, Conn., Gas-Light Co.; Stamford, Conn., Gas-Light Co.; Poughkeepsie, N. Y., Gas-Light Co; Scranton, Penn., Gas-Light Co.; Lewiston, Me., Gas-Light.Co., and one hundred others.

Address **R. A. POTTER, Treas.,**
Amer. Gas Screen Man'f'g Co., Haverhill, Mass.
EDWARD DUFFEE, Agent.

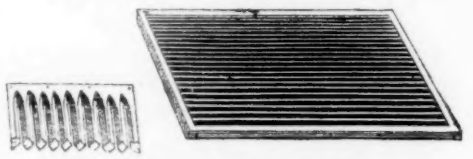
J. L. CHEESMAN.

MANUFACTURER OF

Patent Conically and Diamond Slotted

SOLID WOOD TRAYS.

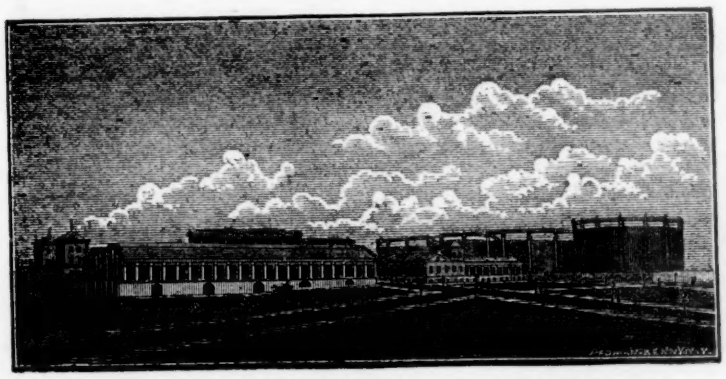
PATENTED OCTOBER 21, 1862 AND JUNE 10, 1873.



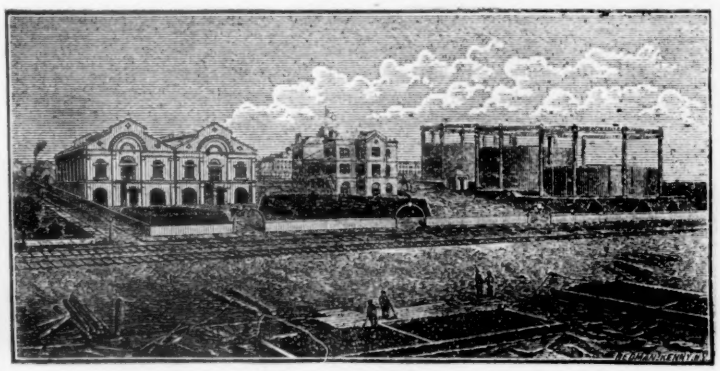
To Gas Companies.

The above Trays will last longer. and are cheaper than any Tray now used. They are now made without any outside strips, which gives more purifying surface, being perfectly smooth. The lime will not adhere to them as in other Trays They are now used in over three hundred Gas Companies the United States, and other places.

JOHN L. CHEESMAN,
151 and 153 Avenue C, New York



CINCINNATI GAS WORKS, ERECTED 1871-72-73.—WM. FARMER, ENG.



LACLEDE GAS WORKS, ERECTED 1872.—WM. FARMER, ENG.

WILLIAM FARMER,

ARCHITECT AND GENERAL GAS ENGINEER,

111 BROADWAY, TRINITY BUILDING, Room 95, New York.

WILLIAM FARMER may be consulted upon all matters connected with the construction of GAS WORKS, or any other description of buildings. Will furnish General and Detail Drawings, Specifications and Estimates for Gas Works of any capacity.

PATENTEE OF THE FOLLOWING INVENTIONS:

Exhausters for Gas and Foul Lime Ventilation,
Dumping Barrows for Coal, Coke and Lime,
Hydraulic Mains for Retort Benches,
Blowers for Forges, Foundries, &c.
Pumps for Water, &c., &c.

REFERENCES:

Professor SILLIMAN, New Haven, Conn.
GEN. CHAS. ROOME, President Manhattan Gas-Light Company, N. Y.
A. W. BENSON, President Brooklyn Gas-Light Company, Brooklyn, N. Y.
W. W. SCARBOROUGH, President Cincinnati Gas-Light Company, Cincinnati, Ohio.
S. L. HUSTED, President Laclede Gas-Light Company, St. Louis, Mo.
Prof. HENRY WURTZ, Editor AMERICAN GAS-LIGHT JOURNAL, N. Y.
GEN. A. HICKENLOOPER, Vice-President Cincinnati Gas-Light Co., Cincinnati, Ohio
FREDERICK CROMWELL, Vice-President Laclede Gas-Light Company, St. Louis Mo.
C. VANDERVOORT SMITH, Engineer Manhattan Gas-Light Company, N. Y.
JAMES R. SMEDBERG, Consulting Engineer, San Francisco Gas-Light Co., Cal. [84y

GAS PURIFICATION.

St. John and Cartwright's
NEW IRON COMPOSITION

Has purified, per bushel, on a single test, 10,000 feet of Westmoreland Gas. With revivification lasts indefinitely. Surpasses in POWER and ECONOMY all known materials. Saves largely in FIRST COST, SPACE, LABOR, SUPERINTENDENCE, and all current expenses. Will purify *easily* sulphurous gas, wholly *unmanageable by lime.* Takes out *all the ammonia.* Now operating in the following Gas Works: Harlem, New York (21st street); Port Morris; Hunter's Point; East New York Worcester, Lynn and Cambridge, Mass.; Lewiston, Maine; St, Albans, Vt.; Pawtucket, R. I.; Meriden, Ct.; and being introduced in many other places.

Cost 70 cents per bushel. One bushel for each square foot of Purifier sufficient. Rights to use for life of Patents, for daily makes of gas in thousands; under 25,000 $200; under 50,000, $400; under 100,000, $500; $250 additional for each additional 50,000 per day.

For further information and instructions, apply to
ST. JOHN & CARTWRIGHT,
21st Street and Avenue A, New York Gas Works.

☞ Immediate arrangements are urged, as the demand for the prepared composition is increasing *so rapidly* that delays in supply may occur.

B. S, BENSON.

MANUFACTURER OF

Cast Iron Pipes and Fittings,

AND

Gas and Water Mains.

All sizes from 3 to 30 inch cast vertically in 12½ feet lengths

Office & Factory 52 East Monument St.,
BALTIMORE, MD.

OHIO GAS CANNEL,
From the Sterling Colliery.

We are now prepared to place in the market, through our agents as below, a regular and unlimited supply of this valuable Cannel, for gas purposes. The analysis made in 1871 by Prof. WURTZ, Editor of this Journal, at the Laboratories of the NEW YORK GAS-LIGHT COMPANY, gave 47⅓ per cent of Volatile Matter and 45 bushels to the ton of a fair quality of coke. The yield of gas was at the rate of 9,500 feet per ton of about 27 candle power. It is not highly sulphurous, can be purified by Lime, and the ash from the coke does not clinker. The above test has been fully substantiated as correct, and can confidently recommend trial of the coal.

TUTTLE & GIRTY Proprietors,
Cleveland, Ohio.

GENERAL AGENTS.

Geo. Merryweather, 52 William St., (Corner Pine) N. Y. Post Office Box, 5415.

GEO. STACEY. HENRY RANSHAW. WM. STACEY.

GEO. STACEY & CO.,

MANUFACTURERS OF SINGLE AND TELESCOPIC

GAS-HOLDERS,

AND ALL KINDS OF

Cast and Wrought Iron Work

Used in the Erection of Gas and Coal Oil Works.

Foundry on MILL STREET; Nos. 33, 35, 37 and 39.
Office and Wrought Iron Works on RAMSAY STREET Cincinnati, Ohio.

REFERENCE.

Cincinnati Gas-Light Co.
Indianapolis Gas Co.
Dayton, O., Gaslight Co.
Covington, Ky., Gas Co.
Springfield, O., Gas Co.
Terre Haute, Ind., Gas Co.
Madison, Ind., Gas Co.
Kansas City, Mo., Gas Co.
Topeka, Kansas, Gas Co.
Burlington, Iowa, Gas Co.
Nashville, Tenn., Gas Co.
Baton Rouge, La., Gas Co.
Saginaw, Mich., Gas Co.
Oshkosh, Wis., Gas Co.
Peoria, Ill., Gas Co.
Quincy, Ill., Gas Co.
Champaign, Ills., Gas Co.
Carlinville, Ill., Gas Co.
Bowling Green, Ky., Gas Co
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R. T. Coverdale, Eng'r Cincinnati, and others.

JESSE W STARR & SONS,

Camden Iron Works

Camden, New Jersey,

MANUFACTURERS OF

ALL KINDS OF CASTINGS AND APPARATUS FOR GAS WORKS,

Wrought Iron Roof Frames,

For Retort and other houses Retorts and all castings required for setting them in the latest and most improve model. WASHERS, CONDENSERS, SCRUBBERS and EXHAUSTERS for relieving the Retorts from pressure. PURIFIERS, varyin from 2,000 to 2,000,000 cubic feet daily purifying capacity.

Wrought Iron Lime Sieves

for Purifiers. Station Meters of all sizes.

GAS HOLDERS,

TELESCOPIC AND SINGLE,

With cast iron guide and suspension frames. GAS GOVERNORS or REGULATORS, STREET MAINS, from 1½ to 48 INCHES DIAMETER, for WATER or GAS. Street Main connections, such as BRANCHES, BENDS, DRIPS, SLEEVES, etc.

STOP VALVES, from 3 to 30 inches, for both Water and Gas.

Wrought Iron Work.

All the Smith and Sheet Iron work required in and about Gas Works. 226-tf

JESSE W. STARR. BENJ. A. STARR. BENJ. F. ARCHER

B. E. CHOLLAR,

Gas Engineer,

914 OLIVE STREET, ST. LOUIS, MO.

265-12t

FREEMAN BUTTS,

Of Cleveland, Ohio.

MINER AND SHIPPER OF THE CELEBRATED AND ONLY GENUINE

Sterling Coal,

also dealer in YOUGHIOGHENY, PITTSBURGH, AND AMERICAN CANNEL. Would refer to the following Gas-Light Companies, who have used the HAND PICKED SELECTED COAL:

New York City, Manhattan and New York Companies, Brooklyn, Albany, Troy, West Troy, Rochester, Buffalo, Oswego, Ogdensburgh, Lansingburg, Newburg, Rome, Palmyra, Geneva, Yonkers, Rondout, Kingston, Albion, Brockport, Seneca Falls, Elmira and Lyons, n State or New York; Cleveland, Toledo, Sandusky, Norwalk, Oberlin, Salem and Fremont in Ohio; Detroit, Ann Arbor, Grand Rapids, Kalamazoo, Jackson and Adrian, in Michigan; Toronto, Hamilton, and Coburg, in Canada; Chicago, Ill., and two Companies in Milwaukee, Wisconsin.

Letters in reference to Coal should be addressed to the General Office of FREEMAN BUTTS, Cleveland, Ohio. 354

MONONGAHELA GAS COAL COMP'Y

Of West Virginia.

OFFICE, 56 EXCHANGE PLACE.
(P. O. Box 432.)
BALTIMORE.

Thomas Gemmell, *President.*
A. Robinson, *Vice-President and Treasurer.*
Benjamin Bissell, *Secretary.*

Mines at Wilsonburg, Harrison Co., W. Va. Shipping Port, Baltimore.

This coal yields of Gas 11,200 cubic feet per ton of 2,240 lbs. and has an Illuminating Power of 16.30 st. candles. 350-3m

TYRCONNELL GAS COAL.,

MINED IN TAYLOR COUNTY, WEST VA.

Company's Office, 52 S. Gay St., Baltimore.

CHARLES MACKALL, Secretary.
CHARLES W. HAYS, Agent, Room 7, 111 B'way, N. Y.
SHIPPING POINT—Baltimore, Md.

This coal yields 10,000 cubic feet of Gas, with an illuminating power of over 16 candles. Forty bushels of very superior Coke, with little Ash, and scarcely any clinker. 304-1y

EVENS & HOWARD,

Manufacturers of a superior quality of

Fire-Brick, Clay Gas Retorts,

Gas Tile, Drain Pipe, Fine Ground Fire Clay, &c.

916 Market Street, St. Louis, Mo.
313-3m

NATIONAL FOUNDRY

AND PIPE WORKS.

OFFICE AND WORKS—CARROLL, PIKE, SMALLMAN AND WILKINS STREETS,

PITTSBURGH, PA

WM. SMITH,

Manufacturer of all kinds of GAS and WATER PIPE BRANCHES, CONNECTIONS, T's, ELBOWS, and all CASTINGS USED AT GAS AND WATER WORKS,

We offer special inducements to parties wishing to purchase. My Pipe is Smooth, regular in weights, and cast vertically.

B.—Pipe from 3-inch and upwards, cast in 12-ft. lengths.

☞SEND FOR CIRCULAR AND PRICE LIST.

T. F. ROWLAND,

Continental Works,

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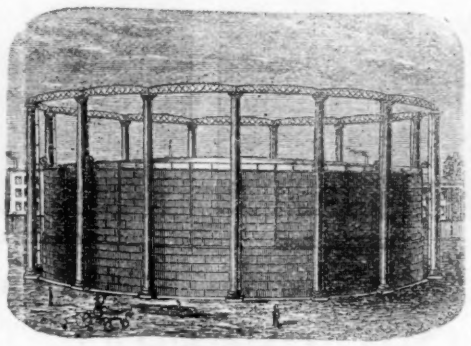

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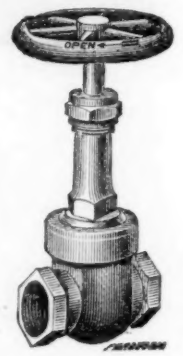

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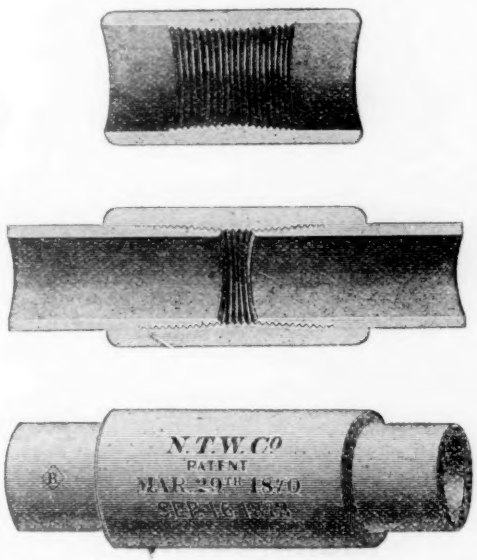

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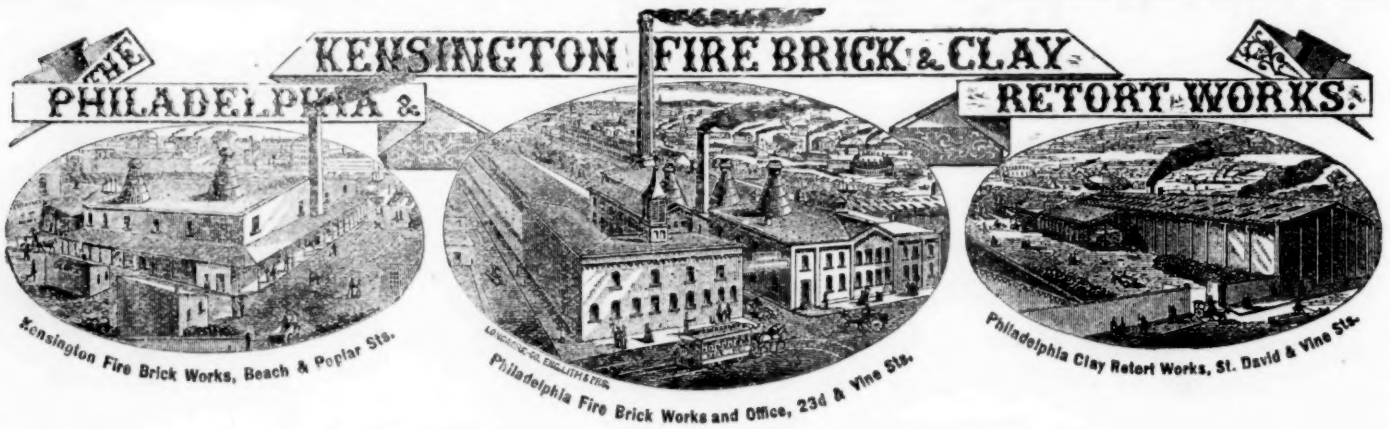
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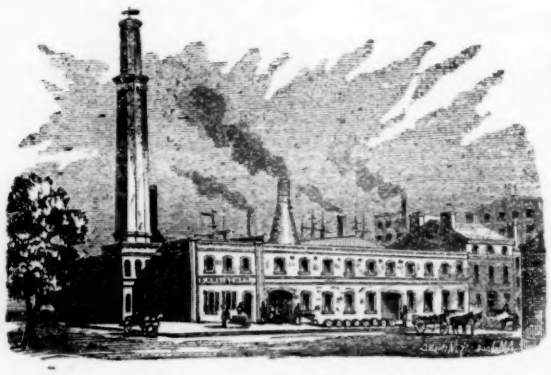

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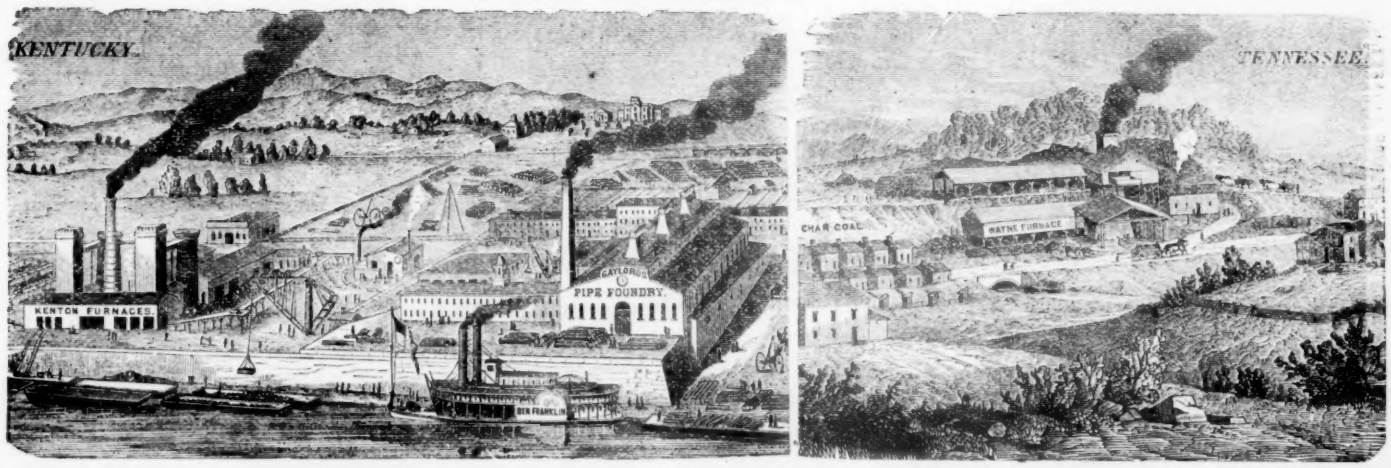

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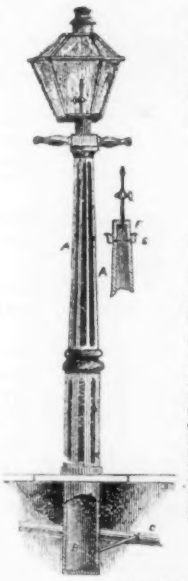

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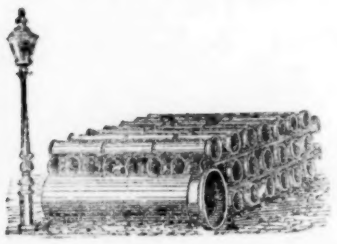

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42 PINE STREET, ROOM 18.

The undersigned having been appointed Special Agent for the introduction of GIBSON'S Substitute for Dip-Pipes in the Manufacture of Coal Gas, respectfully presents for the consideration of Gas-Light Companies the Circulars and Pamphlet issued by the American Coal Gas-Light Imp. Co., descriptive of the value of GIBSON'S Improvement, and the mode by which Gas-Light Companies can satisfy themselves of its usefulness, without trouble or expense, at their own works.

Orders for fitting up Valves of any desired form or patent, *subject to the generality of the Gibson claim*, and also for SUPPLIES and MATERIALS of every description required for the use of Gas Light Companies promptly attended to by

W. H. GRENELLE, Special Agent.

REFERENCE.—RICHARD MERRIFIELD, Esq late Vice-President MANHATTAN GAS-LIGHT COMPANY

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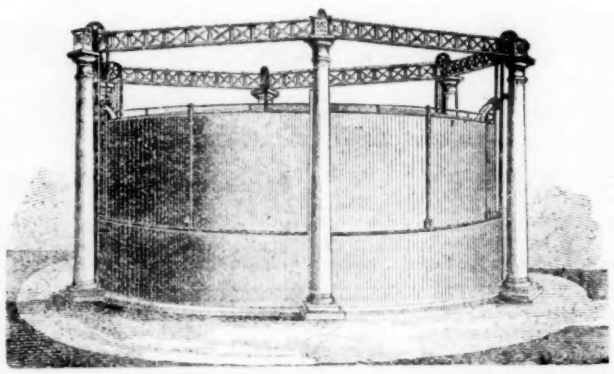

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now the most complete one in the country, for the Testing and Complete Analysis of GAS-COALS and of GASES.

His Apparatus being all arranged at his own residence in Hoboken, and involving many improvements in construction and methods, he is enabled to make such Analyses at greatly reduced cost, and with the utmost promptness as to time, and reliability as to results.

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will be executed, or supervised—when desired—by Prof. WURTZ himself, at the Yard, on the Vessel, at the Mine, or elsewhere. INSTRUCTIONS FOR SAMPLING will be sent, when requested. Charges necessarily vary according to the amount of work done.

QUANTITY and CANDLE POWER of Gas only may be determined, or, in addition, determinations may be furnished of VOLATILE MATTER, COKE, and ASH, of SULPHUR in the COAL, COKE and GAS. Analyses made of the Gas also, and determinations of the DENSITY of the same and of its PERMANENCY under cold, time, and pressure. Elementary Analyses of Coals and experimental determinations of relative HEATING POWER.

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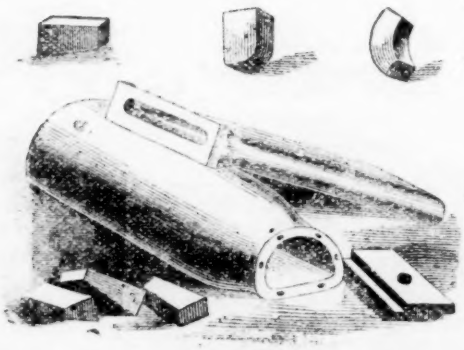

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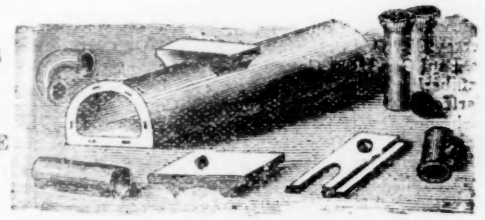

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SCRUBBERS.—Single or Multitubular Scrubbers, with Self-Acting Pumps for Ammonia Water.

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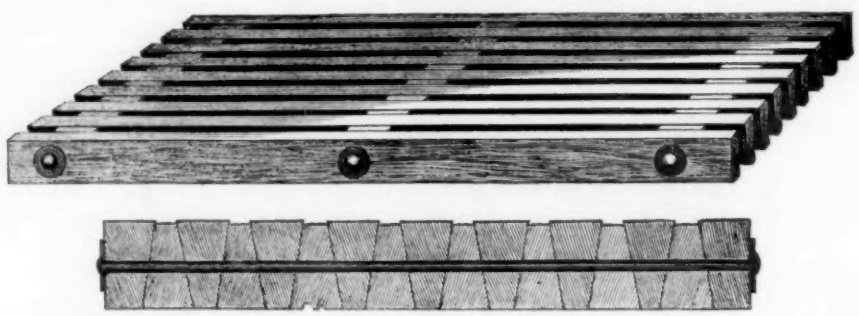

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